# GIS STRATEGIC PLAN

City of Kirkland, Washington

August 2005

Final

GIS Strategic Plan

City of Kirkland, Washington
August 2005

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## INTRODUCTION

In April 2005, the City of Kirkland engaged Woolpert, Inc., to prepare a GIS Strategic Plan. The Woolpert project manager worked closely with the City GIS Administrator to organize a project kickoff meeting and three sets of on-site interviews. A wide variety of staff were involved in this process, predominantly from departments seen as key stakeholders in the City's GIS program. The information gathering during these interviews was used in conjunction with existing documentation (including *2005-2006 Budget-In-Brief*, *1998 LBIS Plan*, and the *Annual GIS Work Plan*) to formulate this GIS Strategic Plan.

The City of Kirkland wanted a plan that would:

- Provide a roadmap of how to best move forward with the GIS program.
- Help define the applications to protect and leverage their existing investment in GIS data.
- Enable a collaborative approach where different departments can work together on a citywide level, and with the neighboring jurisdictions on a regional level.
- Promote knowledge sharing between consultants and City staff, and cross-training between City departments.
- Identify the projects, budgets, schedules, and resources to successfully implement and maintain the GIS program into the future.

This plan addresses these goals and is broken out into the following sections:

- Existing conditions – The current status of GIS at the City.
- Needs assessment – The six-year vision, and the challenges impacting the achievement of this vision.
- Recommendations – Specific recommendations to help achieve the six-year vision.
- Implementation planning – The recommendations summarized and prioritized by individual tasks, budgets, schedules and resources required to implement the vision.

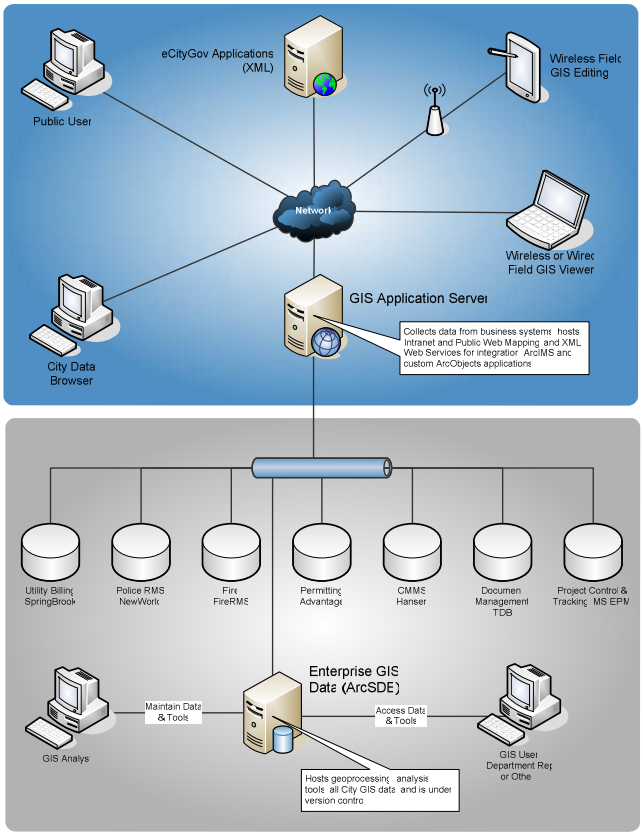
The details of each step can be found in the remainder of this document, while the highlights are summarized in this executive level summary.

# FINDINGS AND RECOMMENDATIONS

It is apparent from the discovery phase of the planning process that the City has fully embraced GIS as a program and technology. Good funding support has enabled the small yet capable GIS Division staff to create useful and time saving tools and data for City staff. GIS data now supports several key business systems in the City, including maintenance management, permitting, police dispatch, and utility billing. In addition, the GIS Browser is used to share data and tools across the city. The success of the City GIS up to this point can be appreciated by looking at the list of accomplishments in *Appendix D: City of Kirkland GIS Report Card* (p.141).

## A Shift in Focus

The City of Kirkland certainly is to be commended for its vision and perseverance in planning and implementing GIS technologies beginning with the 1998 LBIS Plan. The plan itself provided a suggested *enterprise* program framework, a fair amount of technical and project data, and a planning-level budget. More importantly, from this planning process the City's own management team emerged as the dominant driver in implementing the plan's specific recommendations, beginning with the recruitment of a GIS Administrator. Plan implementation as of June, 2005 is nearly complete, and well within the allocated budget.




The 1998 LBIS Plan that established the City GIS was, by design, focused primarily on spatial data development. Good data is a necessary requirement for a successful GIS program, and the City has spent a considerable sum on creating and maintaining key layers like real property, streets, addresses, and utilities.

The focus of Phase II of the City GIS (i.e., this GIS Strategic Plan) is on realizing an **immediate return on investment** for these data sets. While the plan does include additional data development projects, these are specialized supplements to the existing, core data layers. The future of GIS at the City is in decision support through **widespread viewing and analysis** of the data using map-centric tools and browsers.

This vision of GIS at the City of Kirkland is detailed in Section 3 beginning on page p.56. Figure 9 on p.63 shows the systems to support GIS integration across the city, of which the centerpiece is a GIS application server. The role of this server is primarily to support **public and city-only GIS data viewers** that enable viewing of key data like

active permits, street maps, public works projects, etc. This is the type of information that citizens and staff alike need to see on a daily basis.

## Key Recommendations

Based on the findings from the discovery phase and the identified GIS vision for the City, Woolpert recommends a conservative, proactive, and technically sound path forward. Details of each specific recommendation can be found in Section 4 beginning on p.77. The recommendations are grouped into four types: organizational and operational, applications, technical GIS, and data. The general statements below summarize these detailed recommendations.

*We recommend that the GIS program be centralized.* This means having all full-time GIS staff in one division, adopting the centralized application model, and consolidating data maintenance. This also includes a GIS service supporting system to make better use of GIS analysts' time, and adding a full-time equivalent (FTE) in the next two years to support public safety GIS. The City will realize cost savings through more effective resource management, and will have an equitable budgeting model to ensure that departments support the GIS program to the extent that they use it.

*We recommend that more effective use of existing data be made via widely distributed and easy-to-use tools.* The Public GIS Browser and Internal GIS Browser are the main tools to accomplish this goal; citizens and staff can quickly look at city activities and run simple tools to get quick answers to common questions. Lower-level, more technically oriented tools augment these core systems, including a centralized addressing system, as well as creating new data layers for work orders, permits, and CIP projects. This will allow the City to offer much better customer service, and make faster, more informed decisions.

*We recommend that the GIS Division adopt key technologies and approaches for data management, maintenance, and analysis.* These recommendations are specific to the daily technical activities of the GIS Division staff. Data maintenance and QC tools will be enhanced or created to reduce the time that analysts spend on this work. Modeling and data management will be scalable and effectively support the enterprise GIS vision through a complete ArcSDE implementation. With the projects related to this recommendation, the City will be well-positioned to benefit from the analytical aspect of GIS, i.e., decision support for CIP planning, advanced reporting, regulatory reporting requirements, public safety, business development, etc..

*We recommend that the City extend the use of GIS data in the field.* The next logical step for map data that was collected in the field is to get the information back into the hands of City staff who work in the field: inspectors, maintenance crews, police officers, fire fighters, etc. A two-phased approach begins by giving view-only maps to field workers, and then giving a select group the ability to also update the GIS data in the

field. The City will empower field staff to make better decisions based upon current information, and improve the GIS data at the same time.

*We recommend augmenting the core GIS layers with a small collection of new layers, and extending some existing core layers into new areas.* Support for the Fire and Building Department is a key recommendation, and can only be realized if some existing layers are extended to cover the Fire District 41 area to which Kirkland crews are dispatched. Other general purpose layers *within the city boundaries* needed by multiple departments are City-owned property, easements, survey control, and environmentally sensitive areas. These layers will give the City better planning and development capabilities, will save money in utility construction, and ensure regulatory compliance. (NOTE: the geographic extent of the Fire District 41 mapping is approximately the same as the potential annexation area (unincorporated King County) adjoining the city on the north. This recommendation does not include extending *all* enterprise GIS layers, such as utilities, other street infrastructure, etc. through the annexation area; that work is the subject of a separate citywide study on the total cost of annexation.)

## Cost Summary

Table 1 shows a summary cost by project type (first column) if all of the recommendations, and associated work, are completed. These costs are spread across six plus years, and details of the scheduling and City resources needed to complete each project are in Section 5 of this Plan, including detailed breakdowns by project by year by fund. For each year, there is a breakdown of the total cost of each project type by the funding source, i.e., utility fund or general fund.

You will also note a summary of City staff resources, in hours, necessary in each budget year to complete the tasks in this Plan.

**Table 1 - Budget Summary by Fund by Year**

| Project Type | Staff Hours | | 2006 | | | 2007 | | | 2008 | | | 2009 | | | 2010 | | | 2011 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Capital** | **One-Time** | **Ongoing** | **Utilities** | **General** | **Total** | **Utilities** | **General** | **Total** | **Utilities** | **General** | **Total** | **Utilities** | **General** | **Total** | **Utilities** | **General** | **Total** | **Utilities** | **General** | **Total** |
| Organizational &Operational | 1,340 | 564 | $ 50,750 | $ 21,750 | **$ 72,500** | $ 36,500 | $ 33,500 | **$ 70,000** | $ 27,000 | $ 23,000 | **$ 50,000** | $ 51,000 | $ 31,000 | **$ 82,000** | $ 3,000 | $ 7,000 | **$ 10,000** | $ 51,000 | $ 44,000 | **$ 95,000** |
| Data | 1,020 | 700 | $ 79,250 | $ 98,750 | **$ 178,000** | $ 58,000 | $ 82,000 | **$ 140,000** | $ 70,500 | $ 116,500 | **$ 187,000** | $ 31,750 | $ 78,250 | **$ 110,000** | $ 79,900 | $ 122,100 | **$ 202,000** | $ 28,000 | $ 42,000 | **$ 70,000** |
| Application | 1,140 | 260 | $ 45,400 | $ 92,600 | **$ 138,000** | $ 26,100 | $ 56,900 | **$ 83,000** | $ 2,500 | $ 30,500 | **$ 33,000** | $ 12,500 | $ 40,500 | **$ 53,000** | $ 12,500 | $ 37,500 | **$ 50,000** | $ 7,500 | $ 22,500 | **$ 30,000** |
| Replacement | - | - | $ 13,200 | $ 46,800 | **$ 60,000** | $ 15,400 | $ 54,600 | **$ 70,000** | $ - | $ - | **$ -** | $ 17,600 | $ 62,400 | **$ 80,000** | $ 15,400 | $ 54,600 | **$ 70,000** | $ - | $ - | **$ -** |
| **Total** | **3,500** | **1,524** | **$ 188,600** | **$ 259,900** | **$ 448,500** | **$ 136,000** | **$ 227,000** | **$ 363,000** | **$ 100,000** | **$ 170,000** | **$ 270,000** | **$ 112,850** | **$ 212,150** | **$ 325,000** | **$ 110,800** | **$ 221,200** | **$ 332,000** | **$ 86,500** | **$ 108,500** | **$ 195,000** |

**Table 2 - Total Plan Budget by Funding Source**

| Project Type | Total Plan Budget by Fund | | |
|---|---|---|---|
| **Capital** | **Utilities** | **General** | **Total** |
| Organizational &Operational | $219,250 | $160,250 | $379,500 |
| Data | $347,400 | $539,600 | $887,000 |
| Application | $106,500 | $280,500 | $387,000 |
| Replacement | $61,600 | $218,400 | $280,000 |
| Total | $734,750 | $1,198,750 | $1,933,500 |

**Table 3 - FTE Cost**

| | A New FTE Cost | | |
|---|---|---|---|
| | **One-Time** | **On-Going** | **Salaries & Benefits** |
| GIS Analyst | $12,704 | $4,208 | **$70,580** |

## CONCLUSION

The City of Kirkland will realize the following benefits from implementing the recommended initiatives in this plan.

- Improved asset management for Public Works, Parks, and Finance by providing simple tools to access critical datasets.
- Improved decision making for all departments with the enhancement of new critical GIS layers.
- Improved customer service by enabling all departments to complete assigned tasks easier and quicker.
- Streamlined data maintenance to protect the city's investment in developed GIS data layers.
- Growth and development of skill sets for the city GIS staff through a partnering approach.
- Real-time decision making in the field through innovative GIS technologies.

This plan establishes a framework for the next phase of a highly successful GIS program at the City of Kirkland. Further planning is needed on resource allocation, prioritization, and specific assignments within the GIS Work Plan. The city's GIS vision will be realized with a new focus on value-added service to the community, and a commitment to building upon its impressive GIS accomplishments to date.

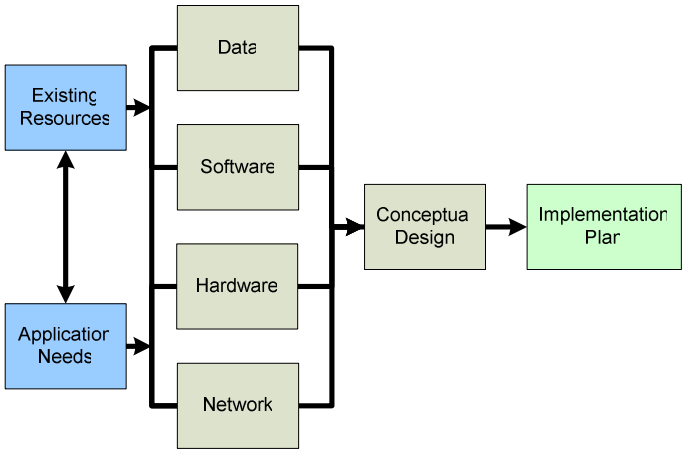
# 1. INTRODUCTION

## PROJECT BACKGROUND

In April 2005, the City of Kirkland GIS Division teamed with Woolpert, Inc. to produce a GIS Strategic Plan. The purpose of the Plan is to guide the city in the development of more efficient standards and practices for the effective use of GIS data and applications within the city departments. The city's long-term goals are to implement these standards and practices within a scalable architecture to provide significant productivity improvements and decision making capabilities.

The planning methodology used by Woolpert has been used on many other projects in the past for two reasons: (i) it is structured toward the needs of the maximum number of staff across the maximum number of departments, yet remains flexible, and (ii) the focus is on producing a plan that is implementable. The goal is to leverage existing resources and then examine all of the variables – needs, requirements, data, software, etc. – to arrive at a conceptual design for an enterprise system, and to create a plan to achieve that goal.

**Figure 1 - Strategic Plan Methodology**




The GIS Strategic Plan delivers recommendations with respect to data, software, architecture and organization that are necessary to facilitate collaboration and information sharing between departments within an enterprise environment. It addresses the different systems in place within the various departments and divisions, and provides recommendations for consolidating staff, software and business processes where appropriate. The plan summarizes the tasks, required resources, schedule, and budget required as a road map to success.

## DOCUMENT ORGANIZATION

- **2. Existing Conditions** discusses the organization, technology and information sharing processes that are currently in place at the city.
- **3. Needs Assessment and Gap Analysis** lists the GIS business needs suggested by the earlier investigative task, as well as analyzing the apparent gaps between the GIS *status quo* and an ideal GIS scenario.
- **4. Recommendations** lists, discusses, and prioritizes recommended implementation actions for the city to consider.
- **5. Implementation Schedule and Budget** presents the Section 4 recommendations as scheduled projects with priorities, cost estimates, and schedules.
- **Appendix A: Detailed Recommendations** supplements to the Section 4 Recommendations.
- **Appendix B: Detailed Project Descriptions** describes the benefits, resources, departments affected, and budget for each of the projects arising from the Plan recommendations.
- **Appendix C: Project Ranking Process** describes the process by which project priorities were set, and lists the rankings.
- **Appendix D: City of Kirkland Report Card** lists the projects already underway and either completed or nearing completion.

# 2. EXISTING CONDITIONS

This section describes the existing GIS condition at the City of Kirkland. Clearly, this involves many factors, but emphasis here is on the institutional structure within which the citywide GIS operates. This GIS framework is introduced at the broad governance level, and more fully described within a department/work group context. The goal in this initial investigative task is to characterize the city's GIS *status quo* based on specific findings from each of the department/work groups participating in this planning process. The primary sources of information in this section are the notes taken during onsite meetings, documents provided by the GIS Administrator prior to the interviews, and other contact with city staff.

Entries for each department/work group contain the following:

- A brief description of **organizational mission**
- **Technology and other resources** supporting that mission
- **Issues** surrounding GIS implementation in the department/work group

The department/work group profiles begin with the GIS Division (IT Department) where a detailed description of city GIS staffing resources appears. Other department/work group profiles focus less on staff resources and more on business activities including applications that currently do, or potentially could, profit from GIS technology.

## CITYWIDE GIS FRAMEWORK: AN OVERVIEW

The pivotal starting point for GIS at the city was the 1998 Land-based Information Systems (LBIS) Plan that described in detail the staffing, data, budget, organizational, and technology resources necessary to build a GIS program. After a slow start, the current GIS Administrator was hired and began a fast track implementation program based on the recommendations of the 1998 plan. This was, and still is, accomplished by an ambitious yet attainable series of annual GIS work plans. By adhering to these work plans, the city GIS is in the enviable position of having:

- Completed in large part the major data layers described in the LBIS Plan within the originally specified budget.
- At least basic levels of integration between GIS data sources and key business system at the city.
- A small but very capable staff of GIS professionals.

- Widely used online GIS data viewing tools that are to varying degrees integrated with non-GIS client/server software.
- Demonstrated value-added efficiencies and decision making capabilities for city staff, managers, and the larger community.

Since 2000 the citywide GIS Program appears to have been consistently supported at the management and budgetary levels because of several factors: commitment to customer service, emphasis on high quality spatial data products, program expenditures based on sound business justification, and an implementation framework that least impacts the organization as a whole. The city's GIS Administrator, with strong support from the IT Department Director and the GIS Steering Team, has been given broad responsibility for completing and maintaining this program. This has occurred within the overall governance framework of three citywide groups: the Information Technology (IT) Steering Team, the GIS Steering Team, and the GIS User Group.

The IT Steering Team has overall responsibility for considering, prioritizing, proposing, funding, and administering technology initiatives including GIS projects.

The GIS Steering Team is composed of department directors and other key stakeholders listed in Table 4 (below). This group meets quarterly, providing direction on the overall usage and implementation of GIS within the city, with particular emphasis placed on the phasing and content of the annual GIS Work Plan documents. By soliciting feedback and critiques from key city departments, the work of the GIS Division closely reflects current and future needs of those departments and the city as a whole.

**Table 4 - GIS Steering Team**

| Department | Current Representative |
|---|---|
| Finance and Administration | Open |
| Fire and Building | Jeff Blake, Director |
| Information Technology | Brenda Cooper, Director |
| Information Technology | Xiaoning Jiang, GIS Administrator |
| Parks and Community Services | Jennifer Schroder, Director |
| Planning and Community Development | Paul Stewart, Deputy Director |
| Police | Kristina Shull, Crime Analyst |
| Public Works | Ray Steiger, CIP Manager |

The GIS User Group meets once a month and is a forum for technical staff and users to share more technical, hands on information and experiences. A goal of the GIS User Group is to ensure a smooth flow of information, ideas, and issues among all active GIS practitioners. While information and discussions in this group help to drive the direction of the city's GIS program, it is not a strategic or governance committee in

the sense that the GIS Steering Team is. Table 5 shows the current membership of the group.

**Table 5 - GIS User Group**

| Department | Current Representative |
|---|---|
| Finance and Administration | Kathi Anderson |
| Fire and Building | Ken Carlson, Chris Rogers, Dave Kryger |
| Information Technology | Xiaoning Jiang, Kim Sun, Chris Mast, Karl Johansen |
| Parks and Community Services | Teresa Sollitto |
| Planning and Community Development | Tony Leavitt |
| Police | Kristina Shull |
| Public Works | Joe Plattner, Katy Coleman |

There are also special-interest groups who focus on specific areas of the citywide GIS:

- Streets Committee (meets as needed)
- Address Group (meets quarterly)
- Permit Plan Committee (meets monthly)
- Public Works Database Maintenance Group (meets as needed)

Naturally, these groups are comprised of stakeholders with a variety of business interests and roles. The goal is to resolve technical and data issues in a focused manner by bringing together subject experts and GIS analysts.

It is worth noting that the city's seven-year-old GIS program has in large part followed its original mandate, confined its expenditures to available budget, and met the needs of a broad cross-section of city staff users. Examining the current GIS environment at the city, the focus of this section, reveals that these past successes are commendable, resonate with users, and should be acknowledged as real accomplishments as new city priorities and challenges are addressed.

# A. GIS Division (IT Department)

## Organizational Mission

The GIS Division of the Information Technology (IT) Department is the city's central work group that provides GIS data, services, and support for the City of Kirkland. While the city has numerous GIS users, the professional GIS staff in this division are the pivotal people who have made GIS a success. The GIS Division is tasked with many roles and responsibilities, including:

- Data development
- Database maintenance
- Products (standard maps, data CDs, custom maps, metadata, analysis, etc.)
- System administration
- Web support
- Training
- Regional coordination
- Program management (staffing, budgets, procurement, vendor management, etc.)

There are four full time staff dedicated to GIS, in addition to a varying number of staff throughout the city who have some level of GIS activity as part of their job description. GIS is organizationally very centralized at the city, as is common in the industry.

The GIS Division itself is comprised of the GIS Administrator and two GIS analysts who are IT Department employees, and a third analyst who is employed by Public Works yet also resides in IT. The goal has always been to develop complementary staff, but also take advantage of distinct skill sets where appropriate. For example, database maintenance is included in the duties of all four staff, while programming, cartography, and spatial analysis are specialty areas depending on individual training and interests.

Interns have been avoided as a resource for database maintenance because of high turnover and suspect data quality. In short, the citywide GIS data sets are a major investment that the city does not wish to compromise with mediocre or uncertain staffing arrangements.

Throughout the GIS implementation, consultants have been utilized to augment program resources on an as-needed basis.

## Supporting Technology and Resources

The GIS Division operates within the institutional framework described earlier (executive and budget oversight, stakeholder participation, IT Department sponsorship, annual work plan). The division also is highly dependent on a compact, dedicated complement of full-time equivalent (FTE) staff, as well as a robust citywide IT infrastructure. This section describes in detail the program's existing GIS staff and specialty software resources. The technology infrastructure supporting the GIS program involves IT personnel in addition to GIS staff, and is described below (B. Information Technology Department). The GIS Division's staffing arrangement is as follows:

## GIS Administrator

The GIS Administrator is responsible for managing the GIS Division. This is divided into two major areas:

- Administration – Defining the annual work plan; keeping track of project status; interacting with other department and division managers on their needs and requirements; creating policies and procedures for data maintenance; managing vendors; creating the annual budget; managing the specific relationship between the Public Works GIS Analyst and IT; reporting to the IT Director and GIS Steering Committee; managing the personnel in the Division; and coordinating Kirkland's participation in regional GIS efforts.
- Systems – Installing, implementing and managing server-based GIS (ArcSDE, ArcIMS) and related data; gathering requirements for and implementing system integration work with other business applications; performing advanced GIS analysis; and completing final validation and loading of core data layers into the production database.

The GIS Administrator is well versed in the ESRI product line, including Geodatabase design and implementation; Visual Basic .NET and other programming languages including Python, the new scripting environment for ArcGIS modeling; and ArcIMS customization (ArcXML, HTML, and JavaScript).

## GIS Analyst 1

One analyst in GIS focuses less on the data development/maintenance and quality control tasks than on the more advanced cartographic services provided by the GIS Division. This is done through a map request process that begins with the GIS Administrator. The GIS Administrator assigns requests to the analyst, who then does the work, makes the delivery, and tracks the time taken to complete the request. There is a tendency for clients to go straight to the analyst for small projects. About 75% of this analyst's time is spent on map making including mapping projects and map requests, with the remaining 25% being devoted to data maintenance.

Key data layers maintained by this analyst are in Personal Geodatabase format and are primarily Planning Department related:

- Zoning
- Comprehensive plan/Land use – In 2004 the major effort was to go through ordinances for each year and update the land use, starting with changes for 1998. Planning reviewed each year's changes before the next year was done; the layer is now current and documented as of 2004/2005
- Neighborhood layer

Most of the maintenance time is spent dealing with managing and maintaining annotation rather than the actual feature geometry.

Map making is a key component of this analyst's job responsibilities, with the Planning Department being the largest single client (400-500 hours in 2004). A significant amount of time is spent changing basic map elements like colors, page sizes, etc, rather than revising the *content* of the product.

Volume map production comes in the form of map book generation. Including initial setup time, a total of 300 hours was spent creating map books in 2004: 140 hrs for surface water utility, 120 for wastewater utility, and 40 hours for police map products. The surface water utility atlas has 200 pages (quarter-quarter section pages), and 8 copies of the book take 40 hours of plotting (5-6 rolls of paper). This is updated twice a year. The wastewater utility map book (quarter section) has 50 pages and is updated annually. The water map book will be initiated in mid-2005 with the completion of the new water base layers. Due to the nature of the water infrastructure, water mapping adds considerable cartographic complexity. In short, a considerable effort is expended on map books. The ESRI Map Book Generator tool is used to do this, even though it has some missing features and is only a code sample.

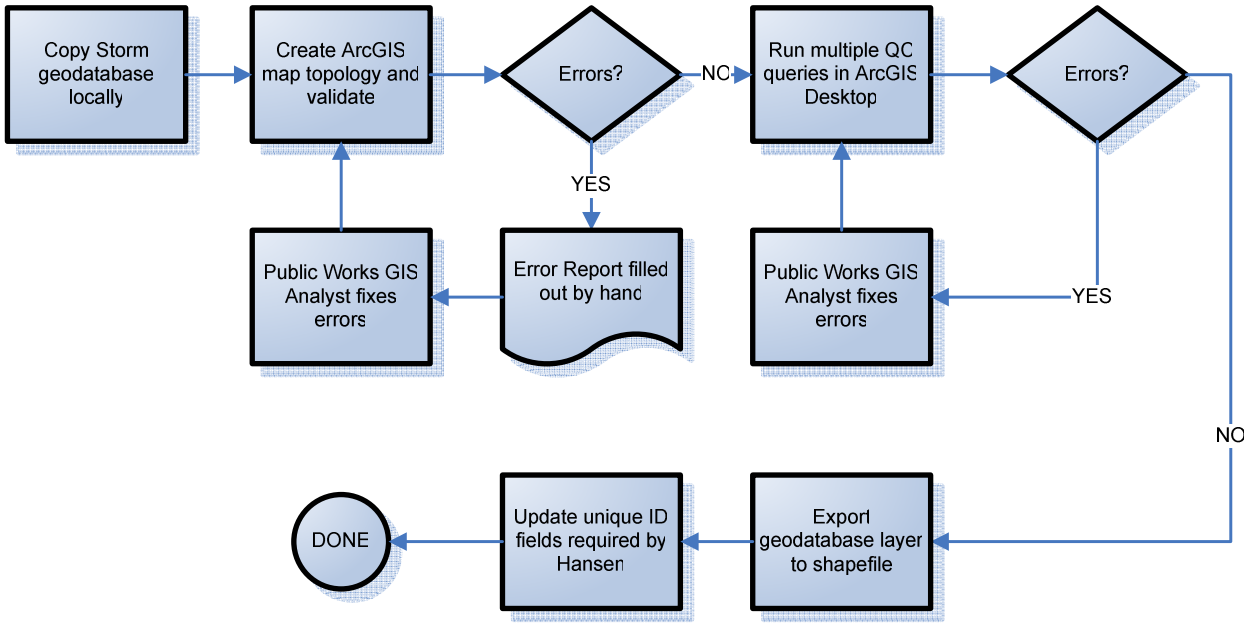
This analyst has training in cartography and image processing (Advanced Cartography; Imagery into Information; and Create Geodatabase).

## GIS Analyst 2

One GIS analyst in the division has a strong focus on non-utility data editing, and in particular maintains the street centerline and address point layers that are used throughout the city. This analyst also performs quality assurance / quality control on utility layers. Overall the division of labor is about 50% data maintenance, 25% map requests, and 25% ad hoc or special projects. The stated responsibilities for this position are:

- Street network – Maintain and quality control for Kirkland, Medina, Mercer Island and Hunts Point street centerlines; perform exports for data deliverables.
- Address points – Maintain address points layer (shapefile); maintain apartment units address database (Access); maintain condo unit address database (Access); maintain business addresses.
- Quality control for Real Property, surface water utility, and wastewater utility. An examination of the quality control (QC) process for just one layer reveals a rigorous yet time consuming, multi-step process:

**Figure 2 - Surface Water Quality Control (QC) Process**




- Mailing label creation, another multi-step process that is time consuming. The analyst outlines it as such for taxpayer addresses:
  - Use the tax parcel layer, the ArcGIS's buffer operation and Select By Location tool to get the parcel identification numbers (PIN)
  - Export the PINs to a .dbf format, import to Access
  - In Access, join the table with PINs to the County's assessment table to get the taxpayer's name and mailing address
  - Extract condos from the PIN table by querying PIN that contains '0000' (all condo PINs end in four zeros)
  - Join the condo PINs table with the County's condo units table to get the condo units owner name and mailing address
  - Combine the two tables with the property owner name and mailing address in Excel

  For site addresses the process is different:

  - Using the address point layer, the ArcGIS's buffer operation and Select By Location tool to get the site addresses.
  - Export the address points table to a dbf format.
  - Remove all fields except address, zip code field.
  - Add a field called "name" and populate "RESIDENT" under that field.
  - Add a field called "citystate" and populate "KIRKLAND, WA" under that field.
  - Save as Excel and email it to customer or import to Advantage.

- Metadata and documentation – The metadata is updated annually for inclusion in the GIS Handbook. Documentation for core layers exists, and others need to be developed. This task applies to all GIS staff.
- Map requests – Although less time is devoted to this than the other GIS analyst, this is a job requirement filled by all members of the GIS Division staff. Part of core layer maintenance is working with time consuming annotation to support map products. Map books in particular require high quality, well placed annotation for place names, street names, and addresses. The Street / Address map books are printed twice a year.

This analyst has training in application automation and development (ArcObjects, Visual Basic .NET, Python).

## GIS Analyst - Public Works

A third GIS analyst position is fully funded by the Department of Public Works and although physically located in the GIS Division, the analyst reports directly to the Department of Public Works Capital Projects Manager.

As with the other GIS staff, this person is 100% dedicated to GIS Work Plan projects. As a citywide GIS issue, there may be some incentive to have the Public Works GIS analyst be formally part of the GIS/IT operation for load-leveling, cross-training, and other purposes. However, the Public Works position will most likely continue as is; Public Works needs require that a dedicated position remain with the department to ensure that their assigned responsibilities in data maintenance for the citywide GIS be done by staff under their direct supervision. As of this strategic plan writing, there is little incentive to move this position officially into GIS/IT if the position's dominant workload is Public Works.

- Primary data layers maintained by Public Works GIS analyst:
    - Surface water utility - mains, inlets, outfalls, manholes, catch basin, record drawing extents, abandoned infrastructure
    - Wastewater utility - manholes, mains, pump stations
    - Real Property – Parcels, right of way, easements, etc. Details of Real Property maintenance are described below (Real Property Traverse Tool)
    - Data layers currently under development that will also be the responsibility of the PW GIS analyst:
        - Water - Field mapped with RTK GPS and laser pointers: valves, hydrants, vaults, and miscellaneous features (no meters). Points are being brought into a Geodatabase and snapped together with linear features.
        - Street lights

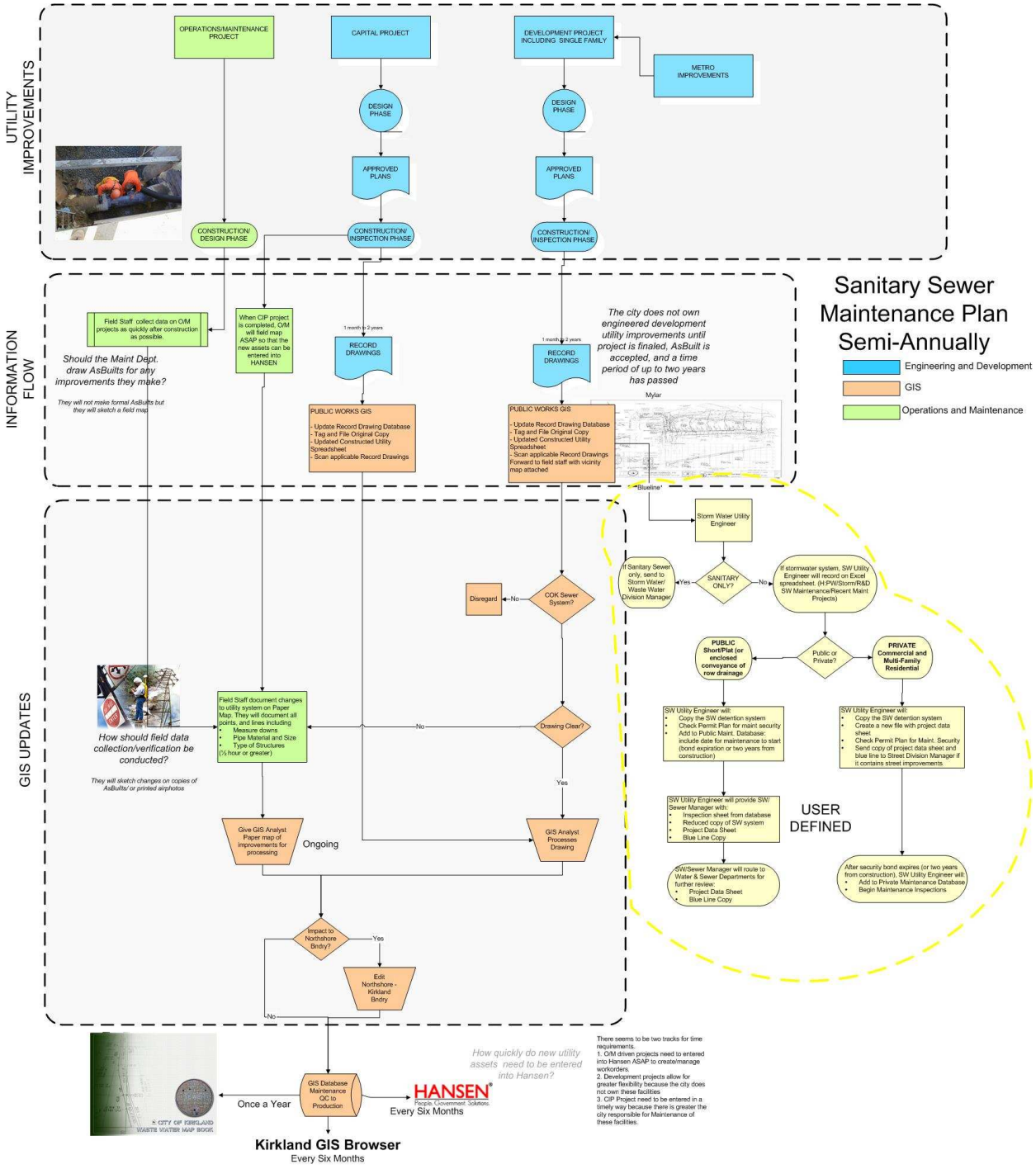
    - Sidewalks
    - Fiber optic
- Secondary data layers – These layers are not routinely maintained, but are updated on an as-needed basis:
    - Trails
    - Solid waste collection areas
    - CIP projects
    - TIP projects
    - Bikeways, walkways, shared use paths
    - Snow routes
    - Pavement management system (PMS); city uses MTS [San Francisco, CA] as a PMS vendor; earlier used Centerline PMS
    - TAZ layer
    - Soils
    - Survey monuments network
    - Traffic control facilities - traffic circles, speed humps, raised crosswalks
    - Speed signs
    - Edge of pavement; building outlines
    - Street trees
    - Signs (The spatial accuracy of this inventory is low, but generally good enough for inventory purposes (+/- 15) feet. This inventory is about 50% done, and at the current rate will take another year to complete.
    - As-built CAD files that come in are subsequently used by the analyst to update the base PW layers. Drawing elements are redrawn rather than imported into GIS because of a policy decision not to require specific CAD standards, although attributes can be used directly.

Approximately 50% of the analyst's time is currently devoted to maintenance. This reflects the large portion of GIS that is related to utility infrastructure. However, this does not include the water system and other new layers that are anticipated to take an additional 20% of this position's time. Thus, within the next 12 months, the Public Works GIS analyst's estimated division of labor will be approximately 70% maintenance and 30% GIS support, projects, and analysis. This leaves little time to respond to analysis requests: e.g., in a water system shutdown scenario, how to efficiently retrieve customer addresses and phone numbers.

Personal Geodatabases are used to maintain the various layers for Public Works. Detailed workflows are in place to ensure that the layers are very dependable, but this comes at a productivity cost particularly when the analyst is dealing with 10-15 new subdivisions every 6 months. For

example, the sanitary sewer utility system maintenance involved numerous handoffs between staff. While many of these steps are required, it does result in a complex workflow:

**Figure 3 - Sanitary Sewer Utility System Data Maintenance**



## Consultants

The GIS Division has also made extensive use of consultants throughout the implementation of the 1998 Plan including ESRI, Marshall and Associates, Triad, Sanborn, Triathlon, and Port Madison GIS, Inc.

During the development phase of the city's GIS program, the city has opted to allocate one-time capital expenditures for outside consultant assistance and projects rather than to add to its full-time equivalent (FTE) staff. Consultants have been used for three key GIS-related tasks over the years:

- Data development – Real Property data development, survey control, address registry, aerial mapping, surface water utility, wastewater utility, street network, Geodatabase design for some of the above.
- Application development – address registry, Real Property editing tools, etc.
- Systems integration – Marshall GeoAdministrator, GeoAssistant, Integrated Map Viewer (IMV).

The services of Karl Johansen of Port Madison GIS, Inc have been used extensively during the various data development projects. Currently Mr. Johansen is working on the citywide water layer(s), and completed the initial collection of surface water utility and wastewater utility at the end of 2004. He has proved to be an invaluable resource to the GIS Administrator and the city in general because of his focused skills related to base layer creation. Whether doing database design (utility layers), process engineering for development and maintenance (streets related), or managing various projects (aerial mapping, sidewalks), Mr. Johansen has provided capabilities that are specialized and available to the point where it would not have made good business sense for the city to acquire this expertise in an FTE. Indeed, with the 1998 LBIS Plan's focus on data creation, the combination of the GIS Administrator's technical and management skills with Mr. Johansen's contribution toward building the "spatial infrastructure" has proven to be extremely effective.

## GIS Software

The city GIS has standardized on software from ESRI. While some batch processing applications in GIS are run using the ArcInfo Workstation software, the city is almost exclusively using the ArcGIS family of products. Current licensing is:

- 3 concurrent ArcInfo
- 7 concurrent ArcView
- 1 ArcIMS
- 1 ArcSDE

- ArcPad

## Data Maintenance Tools

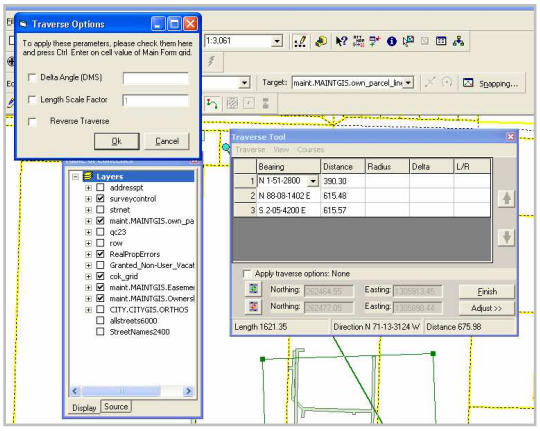
Above and beyond the details of which analyst is assigned to maintain what core and secondary data layers (see position responsibilities above), there are overall conditions that warrant discussion. This section describes layer-specific items and the GIS Division's approach to data maintenance.

A primary mission of the GIS Division is to maintain highly dependable base map layers that are the basis of all GIS analysis throughout the city. For critical ("core") GIS layers there is a defined procedure these layers have to go through:

- Maintenance – For any given layer, one person does all the editing and that particular layer is part of their job responsibilities.
- Quality Control (QC) – One person does all QC for each core layer and it cannot be the person who does the maintenance. Each layer has its own defined QC steps. An error report is given back to the maintainer and errors are corrected.
- Administration – Where appropriate for the layer, the GIS Administrator will perform any final system task, e.g., using the GeoAdministrator tools to push assets into Hansen from GIS.

There are a handful of custom developed data maintenance tools in use in the GIS Division, but the majority of updates are performed using off-the-shelf capability in the ArcGIS Desktop and ArcInfo Workstation software products. For example, the QC process for utility layers makes extensive use of ArcGIS Desktop queries to find attributes that have been incorrectly coded, and temporary topologies are created to ensure proper network connectivity.

### *Real Property Traverse Tool*




Real Property updates are performed by the GIS analyst in Public Works. The process is similar in complexity to the utility layers to ensure high quality core data. The process encompasses parcels, rights of way, easements, and city limits. Although easements have been mapped thoroughly since 2004, prior to that time the maintenance process was intermittent at best. Scanned copies of record drawings are kept electronically. Part of the data maintenance process is to label each hard copy drawing with a TAG (as-built) number, and the analyst maintains a standalone Access database that describes the source, content, and project that the file(s) is/are related to.

In support of Real Property editing, ESRI was contracted to create custom COGO tools. These are in daily use, and seem to largely replicate existing functionality of ArcGIS Desktop 9.x Traverse tools, albeit in a nicely packaged interface. While productivity is increased, the Adjustment option alters the data typed in as well as the calculated information so it is difficult to tell what was changed in an adjustment.

These tools are useful but do not track some information that the analyst needs during the editing process.

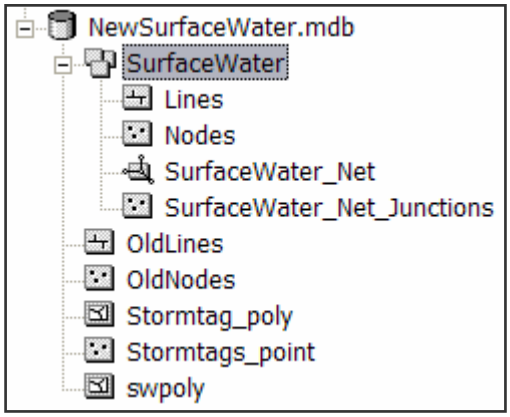
### *GeoAdministrator*

While the edit process for this is detailed in section *D. Public Works Department*, there are specific steps related to Hansen done by the GIS Administrator worth noting. GIS updates have been synchronized with Hansen quarterly for surface water utility (the latest one is in May 2005) and bi-annually for wastewater utility (the latest one is in January 2005). The GeoAdministrator tool for Hansen (ArcGIS extension) is not used to *maintain* the features but for *synchronizing* the data between GIS and Hansen.

The initial loading requires some schema manipulation to create custom fields in Hansen with Hansen Workbench. GeoAdministrator was then used to push data into Hansen. In the future the process will be slightly different: query GIS "WHERE COMPKEY = 0" to find new features, modify the date for attributes changes, and then push data into Hansen with GeoAdministrator.

The GeoAdministrator tools are useful for bulk upload of data from GIS to Hansen but are not used as intended for day-to-day editing because of a known data integrity issue.

## Enterprise Data Sharing




The ESRI data server for spatial data, ArcSDE, was implemented as part of the Real Property data conversion beginning in 2001. All the property ownership data resides there: assessor data through relationship classes and object classes to the parcels, tax parcel, easements, and orthophotos. The other core and secondary data layers are maintained in Personal Geodatabases (Microsoft Access format), or the older shapefile (file-based) format.

A Geodatabase design exists for all of the core layers. There was a plan to load the complete production database into ArcSDE. However, with a test run of an enterprise instance of ArcSDE, the opening up a connection to the GIS data warehouse ("production" version of ArcSDE) resulted in a very long and not very intuitive list of layers, object classes and feature datasets. Users preferred, and therefore still use, the non-SDE mapped network drive with folder schema to access the GIS data.

## GIS-Business Application Integration

The prime reason for GIS at the city has been, and remains, better decision support through GIS-based application integration. For example, knowing where current city projects are taking place is a basic capability that is supported by GIS as resulting from implementation of the 1998 Plan. Details of most of these points of integration are described in greater detail in the department-specific section of this document. However, two applications managed by the central GIS group in particular deserve special attention.

### *GIS Browser*

This is a customized version of ESRI's ArcIMS HTML Viewer (HTML, JavaScript, ArcXML). It is the single most used product of the GIS Division and enjoys wide support as the best tool to come out of GIS since its inception. It resides on a Windows 2003 application server and displays GIS production layers from shapefiles and ArcSDE.

The GIS Browser supports many standard GIS functions such as zoom, pan, simple map printing, selection, buffering, hotlink, and address geocoding. It does not support other capabilities such as advanced printable map generation, address list creation, redlining (edit notification), etc. There are definite "quick wins" to be had by further developing the functionality of this site.

### *Address Registry*

This application was created by ESRI to provide a query and update interface to the address registry data schema. The registry was originally populated by extracting addresses from each business system. These were then augmented with other sources: old paper (scanned) address books, CAD files, field checks, etc. Final address maps were printed and the GIS Division did further field verification. The Address and Streets Committees were formed to provide advice on the address/streets update process and to make recommendations for better addressing standards. The committees also evaluate addresses that are in question and have the final decision in resolving address conflicts. The Planning Department is responsible for providing yearly updates for the apartment addresses and performing field checks when necessary to verify apartment addresses.

The Address Registry now consists of:

- Site addresses (main piece)
- Common Place Names (e.g., City Hall)
- Street names
- Tax Owner addresses
- An editing interface

- An ArcIMS viewer

A detailed schema exists, but was not fully implemented due to complexity once working in a production environment. Many business systems within the city can feed off of this centralized database, and generally do so in a batch export-import mode, e.g., bi-annual import to Advantage, the city's permitting system.

The data behind the Address Registry application interface is in excellent shape (accuracy both spatial and tabular). However, because of the more useful map content included in the GIS Browser the Address Registry viewer has never really been used by the majority of City employees.

## GIS Issues

The GIS Division generally appears to be performing very well, particularly in light of the small staff, and increasing work load as GIS becomes more integrated with other city business systems. There are a number of issues that cause the GIS Division to operate less efficiently than is possible. The issues are organized by category: Organization, Data Maintenance, and Tools

### Organization

- The GIS service process is highly structured largely as a result of the work load on the GIS Division staff. The management of these services is difficult due to a lack of a centralized service supporting system that staff can use to make requests, track requests, and retrieve output of requests like digital maps.

### Data Maintenance

- Feature creation, update, and QC are prime candidates for process re-engineering. Every process described thus far has too many steps involving human intervention where automation can achieve the same or better results.
- The process of informing GIS analysts of data additions or updates is haphazard, e.g., notes written on printed GIS Browser page, e-mail, phone calls. There is not a good tracking or feedback mechanism.
- There are several projects that are nominally part of the GIS Work Plan but have been backlogged for some time. City-owned property has been funded for two years, but the GIS staff has simply been unable to get to this work because of lack of capacity. Similarly, vertical survey control, sensitive areas, and the remaining easements, need to be developed.
- Although hard numbers were not available, anecdotal evidence from GIS analyst interviews reveals that a high percentage of editing time (over 50% in some cases) is spent on feature annotation to support printed maps. No automated tools are being used to support this labor intensive effort.

- The ArcSDE server is underutilized because of the perception that it is too difficult for end users to get to the specific data that they want easily, and because editing workflows based upon versions have not, as yet, been adopted by the GIS Division. Geodatabase topology is another piece of the ArcSDE server that has not been pursued, leading to additional QA steps for the analysts.
- Scanned documents for Real Property updates are not readily accessible to the majority of city staff, even though staff in other departments like Planning can benefit from access to these original documents.

### Tools

- Map book generation is a key function of one analyst, yet this work is being done using some unsupported sample code that has some performance and quality issues.
- More helpful tools with map production are needed if the workload on analysts is to be reduced, e.g., ArcMap toolbar walk non-GIS user through a wizard, or advanced browser-based map generation.
- The GIS Browser does not support key functions like creating print-quality, to-scale maps. This results in more work for the GIS analysts.
- Process automation is not being effectively used in some areas, e.g., the address label creation process is very labor intensive considering the simple nature of the task and the output.

# B. Information Technology Department

## Organizational Mission

The GIS Division is located within the Information Technology Department alongside other groups: Network and Operations, Applications, and (as of June, 2005) Multimedia Services. This IT-centric approach to GIS was initially recommended in the 1998 LBIS Plan and provides the opportunity for GIS to be well integrated with other IT specialty areas, particularly Applications. The conditions in each of these groups are described below.

The 20-employee IT Department is financed using a rate model developed by the IT Director and the Finance director, and is tied to the level of service that each client department receives over the course of the budget cycle. Large undertakings supported by IT, e.g., the current document management system RFP, are generally funded initially as capital projects, and then moved into ongoing operations/maintenance mode.

The Network and Operations Division designs, maintains, and monitors the City's data and telephone networks; acquires and maintains all desktop and handheld personal computers; and operates the Help Desk. The division also manages the City's data center as well as the citywide security policy. This division supports over 350 computers in eleven locations, 34 servers, and services 300 Help Desk calls per month.

The Applications Division supports the city's primary business systems in financial, payroll, utilities, permitting, public safety, and parks and recreation areas. This group also manages the city's Internet web site and provides technical training for city staff in particular business systems as well as standard desktop productivity software.

Multimedia Services is responsible for creation of a wide variety of publicity information for the city, including printed pieces, video, etc.

## Supporting Technology and Resources

### Network and Operations

This is the most technically oriented division in IT, with responsibility for desktop, server, the phone system, and network hardware acquisition and support.

The city has a good existing network infrastructure, including switched 10/100Mbps to the desktop supported by a 720Gbps backplane on the new Dell servers. All GIS servers are dual connected with 2 x 100Mbps network cards, and the network administrator is researching "network teaming" to further enhance the bandwidth available to GIS clients.

Every city building has a wireless 802.11 network. Field access to the city network is available today via GSM/Cell/GPRS, although not many departments are making use of this capability. VPN access to the Intranet is provided through Cisco or NetMotion software. NetMotion is used only by the Police Department now, but will probably be used by most field personnel in the future. All remote city locations are LAN connected on Gigabit fiber, except Fire Stations 24 and 25, and Rose Hill facilities.

There are no limitations on network access inside the city's firewall. However, the only two ports open for external users are 80 and 443. Other ports can and have been opened in the past for specific uses. The Network Administration policy is to only open additional ports once the risk has been assessed. The default open access ports already support Kirkland Parks, Kirkland Permits, Web Mail, and the city Web site.

User level authorization and authentication are handled using a Windows Active Directory throughout the city's domain. Using this same security methodology for vendor-provided applications is preferred over proprietary security mechanisms. In general, IT system administrators keep the infrastructure current in terms of versions and patches.

## Computer Hardware and Software

The standard desktop build for regular city employees is:

- Windows XP Professional Service Pack 1
- Fully patched
- .NET Framework 1.1 SP1
- Symantec 9 Virus Protection Corporate Edition
- Microsoft Office 2003 - Always most current version/patches.
- Java Virtual Machine - not by default but is added where necessary due to version incompatibilities.

GIS-specific computers have the same basic build but are higher end machines:

- GIS - higher end computer, same build but add GIS software
- Dual CPUs
- Higher level of Video RAM / graphics card
- Appropriate GIS software, but primarily ArcGIS Desktop

The standard server build is:

- Windows 2003 Server Standard Edition.
- ASP.NET is installed and enabled by default.
- Server hardware specifications vary depending on their applications. The city standard is to acquire infrastructure that is robust enough to allow for future growth, as much as possible.

For GIS servers, the GIS Administrator has responsibility and control over installation, including the GIS server software, Servlet engine used by ArcIMS, and the ESRI license manager.

Data servers are separate physical machines from application servers.

## Applications

As a general statement, the Applications group supports what is traditionally seen as a core function of municipal information technology: implementing and supporting critical business applications. As such, this group has one webmaster and four application support staff. The interplay between these people and their "client" departments is complex and varies between individuals. Broadly speaking, they can be seen as the resident experts in the various city systems, as well as project managers who own the technical relationship between the city and the application vendors. There is little focus on in-house application

development capabilities since vendors are mostly contracted to provide customizations that are subsequently supported.

As with the GIS group, the Applications staff are dedicated to specific IT implementation projects that equate to departments. Some major business systems that are currently supported include:

- IFAS – Finance system for general ledger, human resources, etc. Linked to Springbrook and Tenrox by automated routines
- NewWorld – Police CAD / RMS system
- CLASS – Parks system for tracking classes and class registration
- Advantage – Tidemark PermitPlan system used across all departments, but particularly in Planning, Public Works, Finance (Business Licensing) and Fire/Building
- Hansen – CMMS used primarily in Public Works
- Springbrook – Utility billing system used in Finance and Public Works
- Tenrox – Citywide time reporting system
- City Web Sites – Managed by the Webmaster

Many of the existing conditions and issues described by this group are deeply rooted in other departments. For example, questions about street data maintenance and availability for the NewWorld Police CAD system are highly important to the IT application staff, but are better described and addressed in relation to each client department.

## GIS Issues

There are many touch points between GIS and the business applications that the IT Department hosts and maintains. Application-specific issues are covered in the section of this document that pertains to the department. For example, issues with GIS and Hansen are noted in the Public Works section. The following are more general issues:

- GIS needs an additional dual purpose application-database server to act as a staging platform for production databases and applications. This is not a current issue, but should be anticipated as reliance on GIS data, processes, and applications increases over time.
- GIS standards and technical capabilities are not well understood by most non-GIS IT staff. For system integration and data interchange this may lead to less-than-optimal processes. For example, the import of street addresses into third-party systems could be made easier with better involvement of the GIS Administrator. Similarly, the ongoing document management RFP process mentions GIS as a requirement, but does not have enough detail like "must allow retrieval of documents by ESRI software."

- Application development that uses GIS is not a major factor, but there are some "unmanaged" efforts occurring in the department beyond the control of the GIS group. This has the potential to add unnecessary complexity for application integration and system management.

# C. POLICE DEPARTMENT

## Organizational Mission

The city Police Department provides a variety of law enforcement services to the community including:

- First-response
- Traffic enforcement
- Criminal investigation
- Community outreach
- Dispatch and records management

The PD is an enthusiastic supporter of the citywide GIS, but is not as far advanced in its use of the technology as some other city work groups. Considering the department's size, responsibilities, and management of large amounts of public safety information, it is an excellent candidate for extensive use of GIS tools for improved decision making.

This study has revealed that the PD has some cross-department business needs not addressed to date, as well as significant regional roles and responsibilities. In addition, the department has been consumed over the last year with the implementation of a new dispatch system. All of these issues are indicative of an expanding need for GIS, and some urgency to address this in the very near future.

The department includes one staff person with moderate GIS skills who uses this technology as a relatively small part of her overall assignment. PD relies on the GIS Division of IT to produce map books, some spatial analysis, and map data for the dispatch system.

The two primary items of GIS relevance for PD are map data (mostly streets network) for the NewWorld CAD system, and general crime analysis/reporting. It is noted that the city now dispatches to several areas outside Kirkland (Medina, "Points" communities, Mercer Island) which is a significant issue in terms of map updates, among other things. As with fire personnel, police are greatly hampered in their pre-incident planning, investigation, and response activities by any map layer that is out of date or incorrect; therefore, GIS support for this work group must take this requirement very seriously in maintaining the citywide GIS program.

## Supporting Technology and Resources

### NewWorld (Police Dispatch Application)

This system is new to the city in the past two years. Based upon selection criteria and the IT requirement that it be entirely Windows based, this suite of software best met the needs of the PD. It has subsequently taken more time to implement than anticipated because of quality of the software provided has not always been up to standard, particularly in the area of reporting and the mobile component (which is what the officers use the most).

Multiple layers are exported from the main GIS database and then imported to NewWorld. The mapping component of NewWorld is based on ESRI's MapObjects software and therefore requires shapefiles rather than Geodatabase as input. NewWorld anticipates replacing this map viewer with one based upon ArcObjects in 2005/2006. While the new map viewer will be a great improvement over the existing MapObjects-based one, it will probably still require an export / import from the main GIS database to accommodate PD-specific requirements. The current shapefile export is done on a regular but infrequent basis, with a refresh rate of about once every two months.


While other layers are important and useful to the dispatchers, the critical layer is the street file with address ranges for the city, Medina, and Mercer Island. This is maintained in the GIS Division (above). The GIS layers form the basis of "good" addresses in NewWorld, so making sure that they are up to date is of paramount importance to the PD and the IT Applications staff supporting them. Any address put into the system is compared against these layers, although there is override capability on unknown or bad addresses because of the emergency nature of many calls.

If a user types in an address that is not found, they should search for an existing address wherever possible. The Communications Center runs a monthly "override report" to examine which addresses were not good when entered. Dispatchers then fix their own errors; i.e., if it just needs to be geoverified. If the address is still not found after some research, the Detective Lieutenant in charge of the Police system sends e-mail to the GIS group to make the appropriate additions or corrections to the base layers. There is no formal system or mechanism for tracking these requests or their resolution. Because all entries in the system that contain an address require geo-verification or override, the Lieutenant runs a report for everything in addition to calls: cases, arrests, persons, etc. These may also result is requests for address updates to GIS.

In the field, there is no such address verification. While the form filled out by officers does have the address broken down into its components, it is only when all data is posted to the main system that addresses are checked. The PD would like to buy in-car mapping in 2006 which will use NetEngine to provide drive depictions, and can assist with in-vehicle address verification.

## Crime Analysis

For simple reporting, the standard tools in NewWorld are adequate. The PD's crime analyst sets up the more complex reports for officers, and is also well versed in the embedded "map reports" available in NewWorld. These reports are also quite basic, with simplistic mapping that is unable to distinguish between incident types. Again, they are also not very intuitive for non-expert users so the officers tend to request summary maps from the crime analyst rather than being able to generate them easily themselves.

The PD's crime analyst has done some preliminary investigation of packaged crime analysis tools that already plug into ArcGIS Desktop, or are standalone tools that work with GIS data, e.g., CrimeView, CopLink, and CMRC tools. Given the effort involved in the NewWorld implementation, the crime analysis evaluation has been put on the back burner for some time. It is recognized that such tools could really improve the PD's use of GIS in actually solving crime. The PD would like more GIS help in predictive modeling using GIS, rather than just static mapping.

That being said, the PD GIS power user is comfortable with ArcGIS Desktop. Approximately 5% of that position is set aside for GIS work. Map books are produced for the officers, and pin maps are created using NewWorld data in the following manner:

- Define a report in NewWorld via a query, e.g., "all graffiti reports in the last 3 months".
- Export the resulting report to Excel (this is a required step because the NewWorld database back end is not directly accessible to end users).
- Geocode the Excel spreadsheet in ArcGIS Desktop with an average 90%+ match rate.
- Generate the map.

## Other

The Police Chief would like to get a variety of crime statistics online for public consumption, including some type of mapping component. The longer-than-anticipated NewWorld implementation has taken up a lot of departmental resources which has pushed this project back, but the desire is still there. Data of interest includes registered sex offenders and basic incident summaries. It would involve the Community Service Unit and

the Police analyst. At present, this unit receives at least a couple of calls a day, plus e-mails once a week via web site asking for this type of information, so a crime summary web site is definitely justified as a community service.

The PD also utilizes first-responder data from King County including apartment layouts, etc.

## GIS Issues

GIS issues for the Police Department focus on two basic things: the currency of street data and quick access to NewWorld data in a map format for display or analysis:

### Data

- A bi-monthly (odd month) street data upload schedule for NewWorld was recently defined by all participating cities including Mercer Island, and Medina. The quality of the street data for the entire service area is high, and requests for updates from the PD are responded to quickly by the GIS Analyst responsible for the edits. However, even if an address is added or fixed the day after it is requested, there is still a two month delay in pushing the change to NewWorld. The process for updating NewWorld streets as outlined by IT Applications is not complex (unless the system must be restarted), so a more frequent refresh could be supported.
- The notification process for letting GIS know about address changes is e-mail based. Tracking requests, and the resolution of those requests, is not formalized.
- Officers / prosecutor / SWAT team all need larger maps for emergency situations, e.g., court buildings.The city's Fire Department may have many of these floor plans as part of pre-fire plans, yet they are not shared.
- Extracting records from NewWorld to map is a multi-step process involving reporting, export to Excel, and geocoding. This is an inefficient process, not only for crime mapping, but for general officer and public access to crime data.
- The graffiti program is cross-departmental with the PD tracking graffiti and the Public Works Department performing cleanup. A GIS Division analyst must currently become involved in order for the crime analyst to get Hansen data relating to graffiti work orders. There is no easy mechanism for mapping out graffiti locations from Hansen in conjunction with NewWorld data.

### Applications

- Officers are interested in the new mobile mapping component from NewWorld that does routing. It is NetEngine based (using shapefiles), but the current city street network does not have the sufficient data to support true routing: turn tables, one way roads, time of day traffic and speeds, etc.

- Map reporting tools in NewWorld are too difficult for officers to use and a simple Web browser based interface is not available. The primary issue is that Officers cannot browse and search data in NewWorld using a simple map even though maps are a primary way of looking at incident data.
- The department needs on-the-fly incident mapping for crime analysis in the office as well as in the patrol cars.
- Lack of training on ArcGIS Desktop extensions, especially Spatial Analyst, is impeding effective crime analysis.

# D. PUBLIC WORKS DEPARTMENT

## Organizational Mission

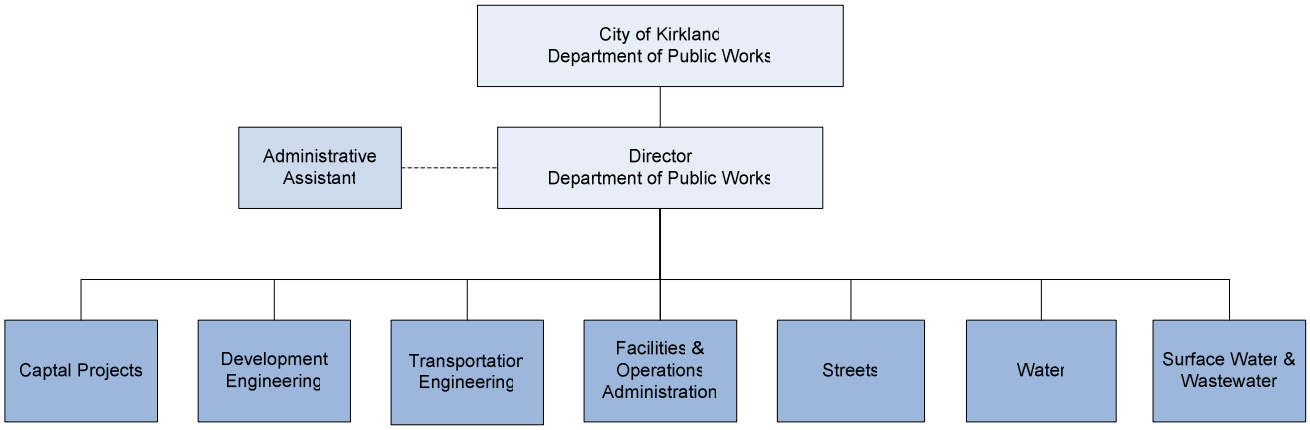
At 86 FTE staff plus 20 seasonal laborers, the city's Public Works Department is the largest single entity within the Kirkland municipal government. The department operates and maintains four utilities (water, surface water drainage, wastewater, and solid waste collection), other citywide street infrastructure (signs, streetlights, transportation network, sidewalks, etc.), city buildings, and other public facilities. Given its size and responsibilities, it is not surprising that PW is the major driver of GIS at the City of Kirkland, prior to and since the 1998 LBIS Plan. PW now represents the largest percentage of city GIS users, data layers maintained and funding share. The use of GIS in PW is now beginning to move beyond data creation and simple viewing to a much tighter integration *among* business systems in a way that makes GIS central to future developments.

The driving force behind GIS in Public Works has been described as:

- Access to information (in terms of data availability, this is highly developed)
- Improved customer service
- Efficiency
- Better planning

In the PW divisions illustrated in Figure 4, the critical touch points with GIS occur primarily through the GIS Browser, the Hansen Integrated Map Viewer (IMV), and the link from Advantage to the GIS Browser. The following sections describe in more detail the existing use of GIS in a variety of Public Works settings.

**Figure 4 - Public Works Organization**




## Supporting Technology and Resources

### Staffing

The Public Works Department has 8-10 staff who can be considered regular GIS users. They do simple analysis, create maps, and use the GIS integration tools provided by the GIS Division. Public Works also has one GIS analyst who resides in the Capital Projects division and reports to the Capital Project manager. This position is dedicated to creating and maintaining those citywide data layers specifically assigned to PW within the GIS Work Plan. This individual also provides other PW GIS support such as custom maps and analysis, although this is limited because of the substantial data maintenance workload. Because this analyst is physically located in the IT GIS Division, and shares similar job responsibilities, details about this position appear in the earlier section of this report, *A. GIS Division (IT Department)*.

### Engineering

Although engineering is split across a number of divisions, the issues facing engineering-related activities are similar so are covered together in this section. The PW GIS analyst (described earlier) is also funded out of this part of the department.

The primary role of the capital project engineers at the city is managing construction projects, whether related to the CIP, or other activities like TIPs. The estimate was that 95% of time is spent in this type of work. A wide variety of tools is used to track project information:

- Microsoft Project
- Excel – Status, engineer, date range, contact, project name. Also printed out 11x17 for public counter to show total project activity.

- Laminated wall map with dry erase markers to show projects with Public Works involvement.
- AutoCAD drawings
- GIS Browser – cannot print to scale, etc., but the orthos are deemed to be extremely useful when talking with contractors. The CIP Project Manager personally uses this tool frequently when writing development plans (copying map images into reports, etc) but would like to see existing and proposed projects on the map.

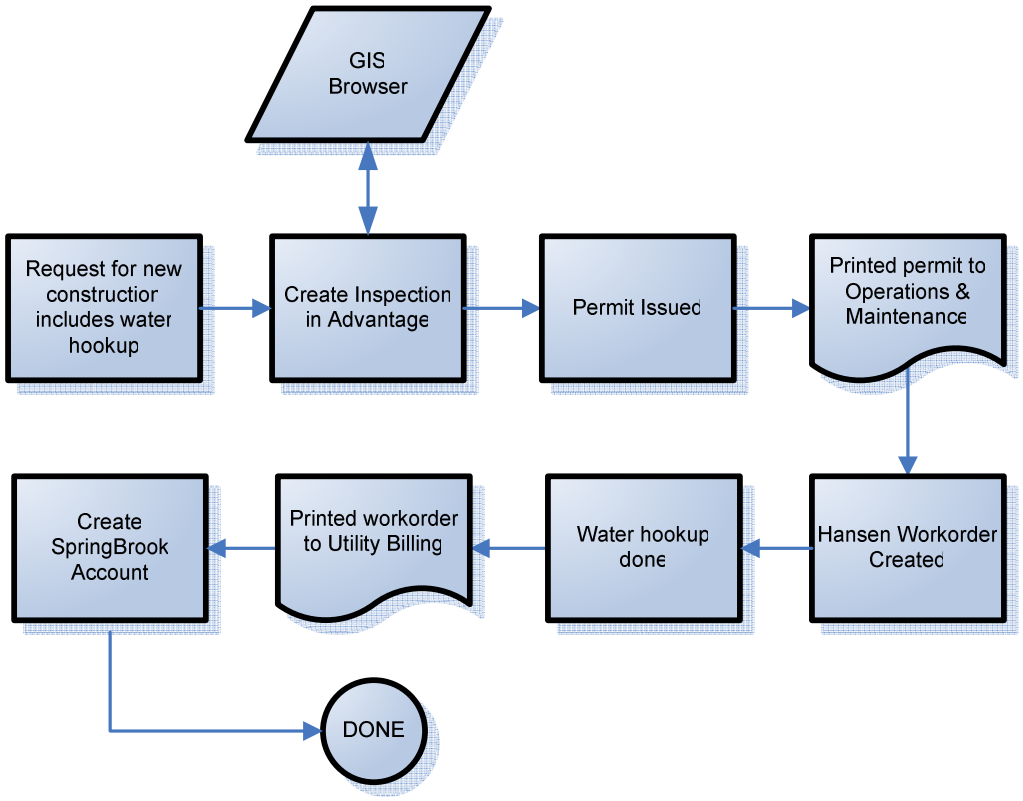
The department's multiple comprehensive plans (water, sanitary sewer, surface water) are major divers of the Capital Improvement Program projects. In addition to these utilities, transportation projects in the city's 2022 network, non-motorized plan, and other planning-level documents contain projects that lend themselves well to GIS query and analysis. With few exceptions, GIS has not been used to complete a plan yet because the data has not been there to support it. However, the Capital Projects manager fully anticipates using the completed GIS utility layers for analysis to support coordination between divisions such as street improvement, water, and development during this planning process.

## Development Review

This part of engineering is a prime GIS user. This division is responsible for reviewing development and building permits, issuing utility connection and right-of-way permits, and being the first point of contact for the public on any Public Works issue. Consequently they are heavy users of all available information sources (even though they are often hard to pull together).

A good indication of the variety of data sources that Development Review staff use is the process to get a new connection set up on the water system (simplified):

**Figure 5 - New Water Account**




GIS data is touched at multiple points along the way, from addressing in Advantage to the GIS Browser. When the water system is completed and synchronized with Hansen, and the meter layer is completed this will be a seamless flow of information. Until that time, a degree of paper-shuffling and data reentry is used.

While inspectors for city CIP projects are hired from outside the city (on contract), there are three Public Works staff who inspect all private development and public works projects, including new water and wastewater utility connections and right-of-way permits. In addition to using Advantage for these inspections, each inspector has their own Excel spreadsheet to manage their individual workloads.

General GIS mapping is performed by the GIS representative (Development Engineering analyst) in the Division. This staff uses ArcMap to create maps for anyone in Public Works, e.g., pavement marking, council presentation, attaching to agreement. This staff estimates creating about one large map project every two months. Beyond that, the GIS Browser is the usual starting point for most map related requests and customer inquiries.

Water Modeling is also a key issue for Development Engineering. As developments occur the Development Engineering Manager works with consultants to determine fire flows, etc. This costs the city about $5,000 - $10,000 per year on smaller models, and once in a while a full model is

developed. These models are not created using GIS since the critical layers are not yet completed, although the system of nodes (from AutoCAD) used to run models are being mapped in GIS in preparation for GIS-based water modeling.

## Facilities and Operations Administration

This division is responsible for system and facilities operations and maintenance, whether reactive or preventative. The division also receives most city calls for service (like a "311" system). The primary business system, the Hansen computerized maintenance management system (CMMS), is also one of the major consumers of GIS data in the city. There is a recognized need for technology enhancements to support the diverse workload of this division:

- Field Computing, including mobile GIS, is a priority for PW staff performing tasks outside the office. Investigating this area is a project in the current citywide GIS Work Plan. The goal is to be able to do work orders in the field electronically, with a secondary goal of doing map corrections in the field. There are 40 crew members in this division so the working lead for each division (part office, part field) will have a laptop. Access to map data for field personnel, including inspectors, is also desirable; to date, this has been limited to crews collecting GIS data.

  The Division manager, City Manager, and others have all expressed an interest in getting GIS data to the field in at least a basic form, e.g., electronic map books.

- Notification Letters are required annually for backflow tests. Many letters are returned as undeliverable, so Springbrook accounting software is checked for more recent billing addresses.

- Timekeeping is tracked in 2 or 3 places. Productivity tracking is done by supervisors for detailed analysis. Payroll is managed by budget number in Tenrox, so it is not per project. Hansen has project level labor time associated.

## Hansen Application

The Facilities and Operations Division Manager is the primary administrator of the city's CMMS system, Hansen 7 for SQL Server. This application was selected as part of a Y2K review, and is currently used for the sign inventory, trees, surface water utility, water, and for scheduling of grease trap work. As soon as more data becomes available for other utilities, work orders will be generated for those assets as well. Currently the city has 22 concurrent user licenses spread amongst water, wastewater utility, surface water utility, customer service, inventory management, facility, and streets/traffic. Public Works has the 2 licenses of Hansen FieldWorks on mobile laptops; the sign inventory is being done using this and there is no equivalent in Hansen 8.

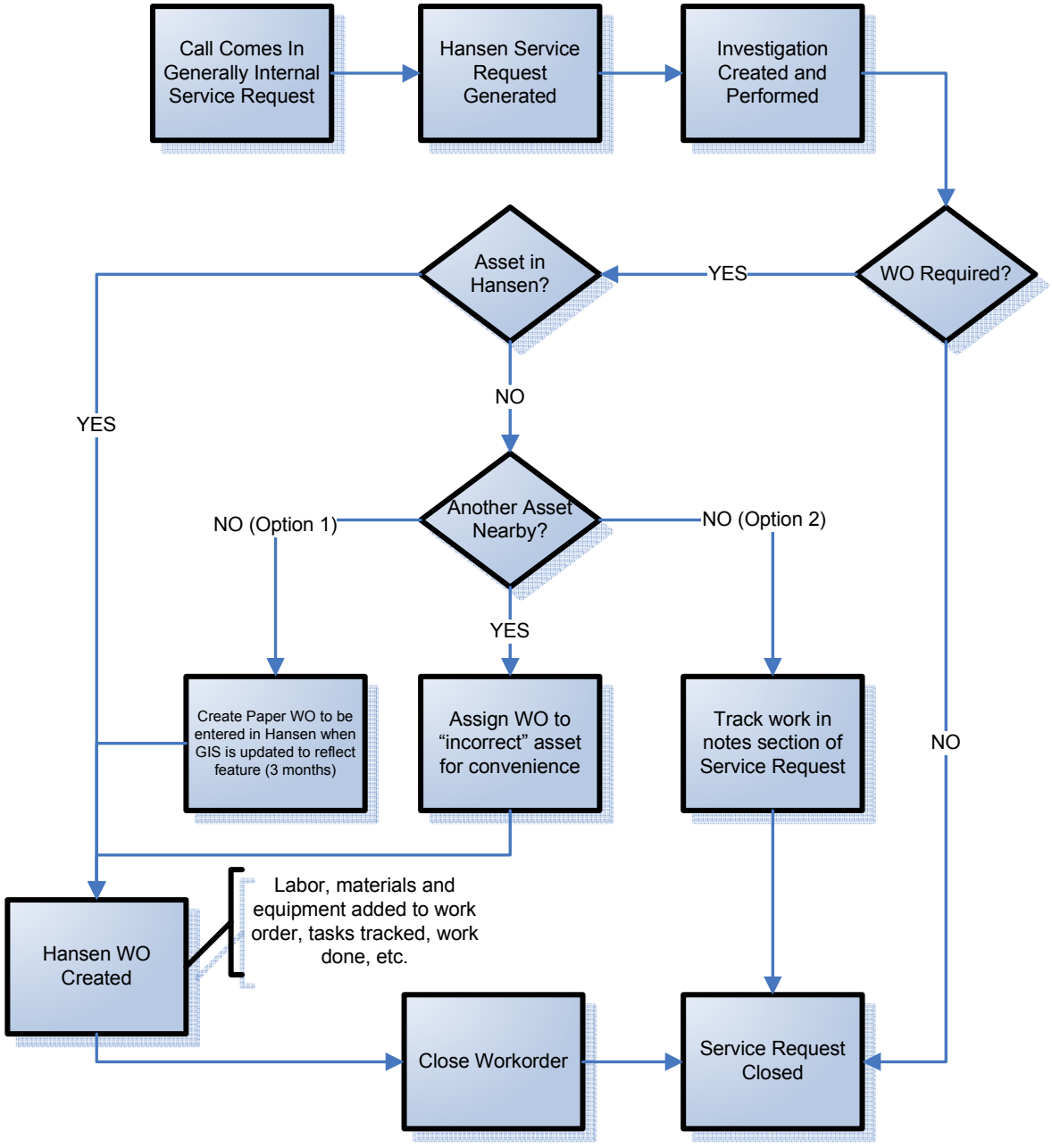
As stated, Hansen was implemented before the GIS asset layers were completed. While surface water, sewer, and all backflow prevention units are in Hansen for annual checks, i.e., preventative maintenance for grease traps, some assets such as water, trees, sidewalk defects, and streetlights are also in various stages of GIS completion but are scheduled for Hansen loading in the near future.

Because Hansen was implemented (i.e., loaded with existing tabular data) before most of the corresponding GIS layers were available, there is now a synchronization issue that must be addressed. Staff utilizing Hansen for work orders may be faced with a somewhat cumbersome procedure as shown in Figure 6.

The division's experience implementing Hansen has been aided since 2004 as GIS data has been synchronized using GeoAdministrator. For general map work, the Hansen Integrated Map Viewer is also being used, although there is a tendency to also use the GIS Browser because it includes a different set of layers. In addition, there is a single primary data entry clerk now which makes life easier for system maintenance. However, there is an outstanding issue that must be addressed which is to 1) load remaining assets into Hansen from whatever source, and 2) keep the Hansen asset inventory and GIS synchronized.

There are work orders where there are GIS assets loaded into Hansen, but no match between the actual asset in the ground and the Hansen database. In these cases, the field team leads are using paper work orders to track work on the assets, and waiting for Hansen to be updated from GIS before entering the paper work order in the Hansen database. While requisitioning is not done through Hansen, an asset inventory is kept there, so this time delay is problematic is some instances.

**Figure 6 - Flow of Hansen Work Request**




## GIS Issues

As a primary driver of GIS since its inception at the city, Public Works is a major source of support for the citywide GIS. Because of this history and its size, there are a correspondingly high number of GIS issues related primarily to data access and application integration.

## Organizational

- By calling the right person, i.e., the project engineer, anyone at the city can get an update on a specific project, but it is hard to get an overall picture of activity across the city. A common question from the public, "Who is working out there?", is difficult to answer quickly. There is no central project tracking, or mapping, of all city projects.
- Project management (budgets, timeframes, contacts, related documents) is up to individual engineers using whatever tools are at their disposal. It is hard to be tactical, and very difficult to be strategic in CIP planning, because no complete picture of past/current/future activity is available. The engineers do a good job of managing information, but it needs to be organized better, especially in GIS-compatible formats, for cross-division decision support.

## Applications

- Much better integration is needed between utility billing (Springbrook), Operations & Maintenance (Hansen), and development review (Advantage). Lack of integration is a major problem both internally and in providing customers with accurate information quickly, e.g., notification letters.
- A "reverse link" to go from GIS to Advantage information is a missing aspect of current GIS integration.

## Data

- The quarterly update frequency of GIS-to-Hansen has been agreed upon by all parties involved. Given the heavy and increasing reliance on Hansen for work management on multiple asset types, this schedule may need to be compressed. Issues stemming from this update frequency include the paper work order tracking outlined above (waiting for existing features to be added from GIS).
- The Police Department does not have easy access to specific kinds of Hansen records, i.e., graffiti. This has been identified as an item of interest by Public Works, Police, and the City Manager's Office (see the Police Department issues section).
- Field access to digital map information is not available, and reliance on paper maps is the result.
- There are no CAD standards for digital plan submittal to Engineering. This means additional work for the Public Works GIS analyst as as-built features are incorporated into core utility layers.
- The easements layer must be completed to include recorded easements not included on plat maps or other sources, especially prior to 2004.

# E. Fire and Building Department

## Organizational Mission

The city's Fire and Building Department has the dual role of providing fire prevention services and managing the permitting process for citywide development. As with the Police Department, this department has regional ties: for example, fire fighters are dispatched from the Eastside Communications Center operated by the City of Bellevue Police Department. There is significant interaction with Bellevue and other neighboring jurisdictions and entities, such as King County Fire District 41, encompassing the unincorporated area to the north of Kirkland, and Northshore Utility District, whose water and wastewater utilities extend through the same area and part way into northern Kirkland.

The department operates and manages Advantage, the city's permit processing system, which is also used by other city work groups. There is obviously a significant spatial (geographic) component of any business system that manages development activity: parcels, street network, utilities, addresses, topography, environmentally sensitive areas, etc., so there is a heavy reliance on GIS data, standards, and procedures by all Advantage users.

The Fire and Building Department has numerous GIS users at a basic skill level, and have utilized one staff person to create major GIS data sets and map products for the adjoining fire district. There is now a recognition at the department management level that the department's specific data development and maintenance needs can best be met by the GIS Division, as long as there are clear guidelines and service agreements. It also seems clear that closer integration of GIS with at least two business systems (Advantage and the Biosystems Fire RMS) is critical to streamlined department decision making.

## Supporting Technology and Resources

### GIS

The primary GIS resource in the department to date is a fire fighter who has done extensive data collection and tool development for the fire crews. Although this individual has accomplished a great deal on limited resources, the department has absolutely no redundancy in the GIS area, and this represents a risk in terms of keeping mission-critical data maintained and current. Discussion has begun about creating a more robust data development and maintenance environment for Fire data, such as transitioning that workload to the GIS Division, but with key Fire Department input and involvement throughout.

The data resources developed at Fire have been with a very specific purpose in mind: to support dispatch and pre-fire planning. Given that,

the QC process on the data is variable, and is only done to the point where it makes sense for particular applications.

Communication with other departments and jurisdictions for data is done on an ad hoc basis: e.g., faxes from the Water Division of Public Works, and many e-mails for data updates.

Beyond the key base layers, the pre-fire planning program and supporting data is very well developed. These include map layers for floor plan with fire alarm panel, elevators, gas lines, sprinkler, hazards, etc. The data is maintained in a Personal Geodatabase, occasionally including georeferenced raster data sets of floor plans:

- 277 higher level preplans
- 80+complex maps (apartments)

The mapping templates to support the pre-fire plans are already built and can be customized to various scales and map layers. These printed map books are the only GIS source for fire fighters in the field; no digital approach has yet been developed.

## Advantage

The Building Division and Fire Prevention Division of the Fire Department are where the city's permit tracking system is situated. Originally Tidemark, now Accela, the Advantage system is actually managed by the Building Official in this department, who is responsible for non-IT administration such as user accounts, modifying system libraries, creating permits, updating and modifying existing cases, and occasionally extracting data and running classes on how to use the system.

The Advantage system includes the System Utilities, Designer, Integrated GIS, and KirklandPermits.net components. There are 50 concurrent licenses with 120 named users, but on average 20-22 people use it at any given time (peak of 49). Advantage is installed on every city PC (except for the PD) as part of the standard image.

The Building Official also serves as the liaison with regional efforts such as www.MyBuildingPermit.com Web site, primarily from a design and implementation standpoint. It is anticipated that the www.KirklandPermits.net Web site (Advantage component) will be replaced in the future by the www.MyBuildingPermit.com regional page, with local customization.

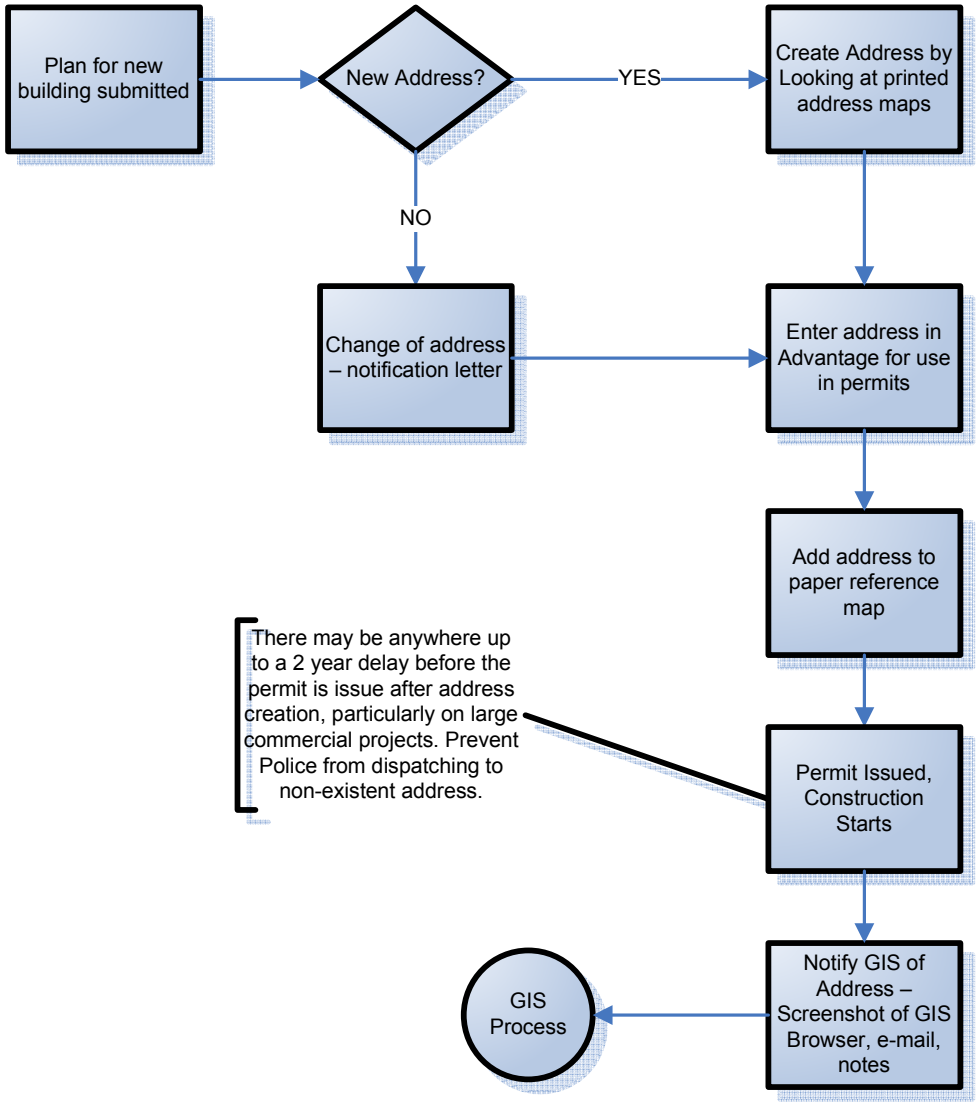
Advantage's master address database now points to a GIS data source table. Originally www.MyBuildingPermit.com used MetroScan data as its primary address source, but the GIS Administrator has subsequently replaced that data. This site continues to be a source of bad addresses because users can just type them in. Eventually IT will have those

permits pushed into Advantage for automatic creation of AA a permit instead of via e-mail.

Advantage is the system through which new addresses are created in the city: the process is shown in Figure 7. Older, existing addresses are not good, e.g., structure numbers because Advantage was started in 1986 - 1991, prior to GIS. However, recent information should be of high quality.

Once addresses are created here, there is a handoff to GIS so that the new points can be added to the base layer(s). Again, the process for data update is well defined for the GIS Division analyst, and is described earlier in this section. The GIS Administrator runs a bulk address update process to a central address database. AML programming is used to do GIS processing like overlays to augment the addresses with King County data, e.g., legal description, addresses, etc. Once every six months IT loads the refreshed data into Advantage.

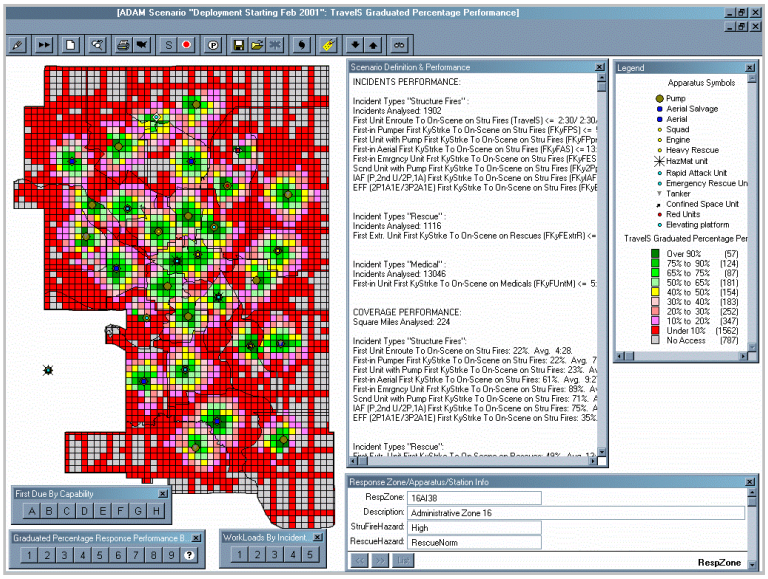
**Figure 7 - Address Creation Process**




## Fire RMS

The Fire RMS is a primary system for all staff for incident documentation, particularly at the battalion and higher management levels. Latitude/longitude of calls from Fire RMS (Biosystems) are used for mapping, primarily by type of call and incident information. A variety of other tools like Excel and Word are used to maintain response plans (units assigned to particular kinds of 911 plans) for the dispatch center. There is currently no linkage between GIS data and any of these sources.

## Deccan




The Chief is applying for grants to fund acquisition of the ADAM (Apparatus Deployment Analysis Module) software from Deccan. It will allow them to do response time mapping and firehouse placement, plus manage incidents where roads or bridges might be out, where they can place resources to respond to incidents. Any GIS person or position they fund in GIS/IT would also need to be able to work with the Fire Department through the use of this software. ADAM will be very important in terms of the ECC (Emergency Coordination Center) activities as well. During an emergency, this person would be relocated to support the department during an incident. Even if a public safety-related GIS analyst is not funded, IT will still need to be knowledgeable of and support the implementation of ADAM, as with other business systems throughout the city.

The Deccan software is very map centric, and is built on top of a product called MapInfo. This is not the same as the city standard (ESRI), although the data requirements are similar to the Police CAD system. In addition, the tools are being migrated to an ESRI platform by Q1 2006.

## GIS Issues

Most issues that concern the Fire and Building Department are related to data, whether the street centerlines for Fire, or the high quality address points that support many city applications, including Advantage.

- A primary concern is that the city GIS does not include high quality street data in Fire service areas outside of the city limits, i.e., Fire District 41.
- The city has a critical business need to get accurate updates to the street network to the Communication Center in Bellevue. Better methods need to be established and responsibility for this function should be reviewed to make sure it is appropriately assigned.
- The firefighter leading the GIS effort is only on duty every 3rd day. The concern is that something critical will come up when he is not available.
- Computers being installed in trucks are owned by Bellevue and so no Kirkland data can be put on them. Alternatives for pre-fire plans and data entry in the field are being investigated. It is highly desirable that Kirkland fire personnel have access to their city's highly accurate and complete GIS data on the actual fire vehicles, not simply in the office.

- The impressive collection of base layer / pre-fire layers / map templates that have been amassed are not accessible to anyone outside the FD.
- The addressing process is centralized, with a well-defined procedure, but the resulting address database is not recognized or accessible as the single source of information for all city applications.
- Some security issues exist with Advantage, such as level of access to do permitting type work but also allowing individuals to add addresses as well – this means there are opportunities for poor address data to get entered into system and then subsequently used in a permit application.
- There is no method to indicate when an address is no longer valid for Advantage use, and is therefore unavailable for selection.

# F. FINANCE DEPARTMENT

## Organizational Mission

Finance is composed of several divisions, including Financial Planning, Treasury, City Clerk, and the Municipal Court. GIS is used in all of these divisions except for the court, which uses a non-GIS, state-mandated system called Discus. Basically all aspects of city financial and accounting operations occur in this department.

The department's responsibility for financial management means that it is a major participant in business systems, including those in use by other departments. This also means that, since the bulk of this information is location-based, there is substantial need and justification for GIS tools within this department. And as with other departments, certain users within Finance need the ability to easily access all associated records from relevant business systems in a geographic (map) view.

## Supporting Technology and Resources

### IFAS

IFAS is the financial software being used for Human Resources, General Ledger, Puchasing, etc. BiTech is the vendor of this UNIX based system powered by the Informix RDBMS. Integration with this product is done via automatic imports of text file data. The automated routines are written by the vendor and are flexible enough to be adapted to additional imports. Both Springbrook and TenRox feed information into IFAS. BiTech does have online modules for employee on-line, but these have not been purchased or implemented.

### Springbrook

This is the address-based utility billing system for water, solid waste, and wastewater utility. The backend database is Progress. A feature of this

database is embedded scripting so that the database is very "smart" while the application interface can be "simple" – similar to having the database and application server all in the same place. There is an ODBC driver, but it can be awkward to extract exactly the data required for other applications because of the scripting.

There are about 13-14,000 accounts in Springbrook for water, wastewater, and solid waste. About 10-20 new accounts are added each month. Water billing starts from meter installation date, so a service may have been installed 4 months ago, but if a development has just been finished, back bills are sent. Adding accounts is dependent upon Building Division creating addresses on maps (usually by developments/subdivisions) and then providing those to Utility Billing. The addresses are known to be of good quality because of data entry standards. A complete geocode of Springbrook accounts was recently done and resulted in 95% + match rates.

Springbrook is already tied to the GIS Browser to some degree with a "GIS" button. A user can search by account number, and then click a button to open the browser. The accounts/customer locations are not currently mapped, however; the user must still navigate to the desired location using address, parcel number, etc.

Additional GIS tie-ins or requirements:

- *Where is my water meter?* The GIS Division is going to complete this project. Every customer has an account number, every property has a reference number, and meters are assigned to property.
- Customer Service Reps need to be able to cross reference a Springbrook account with neighboring properties.
- GIS analysis of areas is needed to answer questions like "How many commercial vs. residential accounts are there?" Currently this type of analysis is a manual process involving the geocoding of accounts.
- Including different layers in the GIS Browser would help to answer customer questions. For example, people complain about water usage. Looking at the location of the property using contours and orthophotos could help, e.g., sprinkler system is on a steeply sloped property with high runoff.

Utility Billing also works closely with PW on meter reads/repairs, etc. Advantage is consulted to determine permit activity, such as when water was installed.

## Tenrox

This is a new time sheet system that will be used by IFAS to generate payroll for city employees. Tenrox uses a "project" approach to tracking expenditures on particular city activities. The projects are set up by Finance for accounting purposes, and these project definitions do not necessarily reflect the various project numbering systems used by other departments. While Tenrox is an

excellent new system for the city, it does not support project cost tracking in a way that is easily integrated into other systems like Hansen and Advantage.

### Advantage

This is the system used for permitting and licensing. Some activities in Finance are also tracked or access information from this system. Business licensing is done through Advantage permit system. Finance quite often gets geographic based queries about business activity: type, open, closed, business license revenue generation, business by SIC code. As part of Advantage the addresses are of good quality and can be geocoded for map analysis and map production.

## Other

### Sales Tax

Finance has a separate application called TaxTools. This is a sales tax database and query toolset. TaxTools can be linked to Advantage.

The way that business locations are stored in TaxTools is problematic for area-based reports. Each business name in TaxTools has one address associated with it (the address is pulled from Advantage). However, many businesses have more than one location within the city. The question is how to divide up the sales tax for several business locations when all of the sales tax is associated with only one record in TaxTools?

Reports can be generated that show sales tax by business district (7 identified business districts), and other areas. However, the reports are very labor intensive because of the one address-multiple location issue described above.

### Cemetery

The city sells property in the city-owned cemetery. These transactions are handled just like any other transaction. Specifics about this city property asset are contained in an internally-maintained database.

### GASB34

The city went live with GASB34 fixed asset reporting in 2003. Engineering helped by adding infrastructure layers - curb, gutter, lights, ROW – into an inventory. Historical King County property records were incorporated, and Accounting put a value on existing assets. As projects are finished by PW Engineering Division the high level costs are provided to finance and tracked by project number. With the help of GIS, Accounting established beginning quantities of assets such as streets, sidewalks, street lights, traffic signals, bridges and parking facilities. Other assets, already being documented by the utilities, are also contained within GIS. Those items directly correspond to the water,

wastewater, and surface water utilities. GASB 34 did not create a change in tracking assets for the utility funds.

Currently, the financial impact to the city of completed projects is tracked via the financial system and the project cost is then layered onto the asset list. At the end of each fiscal year the cost of closed projects is added to the existing asset calculation, although the units/quantities of the completed infrastructure are not consistently contained in the calculation. At this point that information resides with the project engineer. The reports must be updated each year, and all data is managed in Excel. Part of the justification for Hansen was to support GASB requirements.

### GIS Issues

- Automated geocoding of Springbrook accounts would alleviate many issues by making data immediately available for GIS analysis, inclusion in GIS Browser, etc. It is not currently available.
- One reason that the city does surface water (surface water utility) billing through King County is that utility fees are parcel based, while Springbrook is a meter/address based system. In the event that city wished to bill directly for surface water charges, a process would need to be developed to link city Springbrook accounts to parcels.
- The GASB34 reporting tools rely on manual information transfer to Finance, where it should be automatic. Accounting should be able to easily run GASB-style reports every day if necessary, not just once a year. There is a disconnect between Engineering project management and reporting project asset values to Accounting. In other words, a lack of GIS-based asset valuation or citywide project management tools means a duplication of effort and data in GASB34 reporting.
- Layers to support business license queries are not available in a simple query or browse tool, e.g., “show me all business license revenue by city neighborhood/ZIP/business area/Council district”.
- Utility Billing is notified of new addresses by Fire and Building. This is the exact same process as for notifying GIS of new addresses, so two processes exist to accomplish the same goal.

## G. Parks and Community Services Department

### Organizational Mission

The Parks and Community Services department includes a staff of about 40, with the Parks Maintenance group hiring about 24 temporary and Community Services hiring about 75 seasonal employees in the summer. Although the department is sizeable, there is no CMMS in place. There has been some interest in Hansen but no plan to move ahead with it. All

maintenance is therefore done using a paper-based system that severely hinders tracking costs, equipment, or just staff activity. The Tenrox timesheet software does allow some degree of budget tracking through labor hours.

## Supporting Technology and Resources

### GIS

Most GIS use in this Department is in park planning creating simple maps for public process meetings, either created by the Parks planner or by the GIS Division. The director will commonly use the GIS Browser to locate properties for acquisition, and then consultants will take over for further analysis. Consultants would really like to be able to get access to the same base data. The department also is the sponsor of a popular, high quality parks and trails map that needs to be maintained regularly.

Considering the great emphasis the city places on parks and recreation amenities, and popularity of the city as a leisure destination, there is ample opportunity within this department to capitalize on the city's GIS resource.

Other GIS:

- Parks needs to have the ability to coordinate closely with both Public Works and Planning on ongoing projects. This is an issue of cross-departmental data sharing about the location and timing of major activities like capital projects.
- Maps for crews to know where water meters and other assets are.
- Tree canopy mapping for Green Kirkland project – While the Natural Resource Management Plan has some data, this new project will require remapping of all parks. Layer creation will be contracted out, or possibly done in house.
- There is a need to geocode home addresses of people registering for classes online – See where people are coming from, and what parts of town they like to avoid - long range planning.
- The department wishes to geocode citizen requests, especially when sorted, e.g., graffiti repairs vs. other kinds of work.
- The Parks Director would also like to get hand held computers for data access in the field.

### CLASS

The Community Services Manager handles all class registrations, the Community Center, Aquatic Center, and Senior Center, with 16 FTEs. The CLASS software is in place to track and make all of the registrations in the city, and it also has a regional front end developed by the eCityGov Alliance - www.myParksAndRecreation.com.

The critical tie-in with GIS is address location. The rule is based on whether a registrant lives or works in the city. That tells the CLASS system what kind of user to set the account up as, and which differential class prices to use based on that residency. Currently this check is done manually for 2,500 registrants per year of the total 20,000 customers per year total. Five registration people in Parks create profiles for customers and do this work for new accounts and others by looking up addresses in an online form that registrants send via e-mail. The online form is used precisely *because* instant city/non-city status is not available via address and it means there is a 48 hour turnaround time between someone wanting to register, and someone *being registered*.

This issue stems from the fact that many of the addresses being checked fall outside of the city limits, such as a Kirkland mailing address in unincorporated King County, or have a 98033 ZIP code and live in any of three or more jurisdictions. The primary issue is a lack of a standardized area-wide address source for regional use. The data used by Police and Fire may augment this in the future, but is not currently in place.

Discussions between Parks, IT, and CLASS vendor Active have been going on for some time, and the API necessary for low level integration is about 3 years away from being available.

www.myParksAndRecreation.com is a regional version of the same kind of thing. A Web developer at eCityGov Alliance cityis creating this in a phased approach:

- Phase I - Multi-city search - just searching for classes across cities
- Phase II - set up profiles, billing, searches, and resident location (GIS)

The city managers in the region would rather just adopt a flat rate because it is easier, but Parks feels that the existing $50,000 per year non-resident fees can be significantly increased by incorporating instant geocoding. This requires a repository of well-maintained, *regionally standardized* addresses.

## GIS Issues

- The city lacks reliable data on city-owned property to support analysis of new park facility locations.
- Printing out maps is more difficult because they are in a different building and there is no plotter there.
- Non-city users of GIS cannot access base data through public web site, e.g., consultants, employees not connected to the Intranet.
- People can't create an online CLASS profile because of the manual address check – takes staff time, and seriously impacts customer experience of the online system. RecWare's CLASS software is not open to external

developers, so the issue of how to dynamically get a good address remains an unresolved one.

- There is no automation in work management – not tied into Hansen CMMS.

# H. Planning and Community Development Department

## Organizational Mission

The day-to-day activity of this department is focused upon long range planning, developing code, zoning issues including permit review, and economic development. The departmental GIS representative is very capable and provides numerous map products to internal (department) clients. There is a lot of work, however, and heavy use of GIS/IT for map production at the expense of GIS analysis. Interviews with several planners reveal overall satisfaction with current GIS use, but understaffing in Planning means that a wide variety of projects have been left untouched up to now.

The department is responsible for submitting a wide variety of reports as part of the city's compliance with regulatory agencies. The department also is a key participant in interdepartmental development review activity, especially from the standpoint of code compliance and environmental regulations. The department includes numerous planning professionals as well as the city's urban forester. There is currently no GIS analyst within the department; most GIS tasks are done through a service level agreement with the GIS Division of the IT Department.

## Supporting Technology / Resources

### Reports

Reports are spatially based but do not leverage GIS to generate them. IT actually supports quite a few reports from Advantage by using Crystal Reports. Reports include:

- Annual population estimate for use by the State – incorporates building permits, vacancy rates, buildable lands, vacant land, etc.
- Buildable Lands - All Puget Sound counties have to do this, so Kirkland feeds information to King County. Tracking land development and availability of land for planning purposes. It has a set format.
- Land Capacity Analysis – Formerly done by a consultant, so while the desired results are known, the process by which they are generated is not.
- Community Profiles – Incorporate plans, building activity, etc.

Almost all reports are driven by building permit activity so having these in the GIS is critical. Many of the map products requested and required

for Council presentations as well as economic development activities benefit greatly from the inclusion of orthophotography for analysis and context.

### Advantage

Planning is involved in the permitting process across three different departments: Building, Planning, and Public Works. All signoff is done electronically

On a daily basis the Accela Advantage/GIS Browser link is used for calls generated by residents, planners looking for building permits, or checks on ownership:

- Find address in Advantage
- Enter it in GIS Browser then find the address that the person is calling about, which is generally not the same address as the callers'
- Go back to Advantage and type that address (the one found in the GIS Browser) in Advantage to find permits.

Planners and call takers would also like this workflow:

- Open the GIS Browser.
- Run an address or parcel search of caller.
- Pull up the found address/parcel, then navigate to the permit that is being searched. The map would have all permits as icons on the map to make it easier to find.
- Click to get a list of all permits (historical/active) then get into Accela again at that point.

This workflow usually leads to describing permits to a caller, not necessarily generating reports. The www.KirklandPermits.com web page allows access to all of this information, but the *address of the permit must already be known*. That is an assumption that is usually not true. A public view of this data must therefore support more general searches.

Planning's www.KirklandProspector.com is being replaced by an Alliance project – www.NWProperty.net - and relies upon a GIS back end to find commercial properties for sale or lease.

## GIS Issues

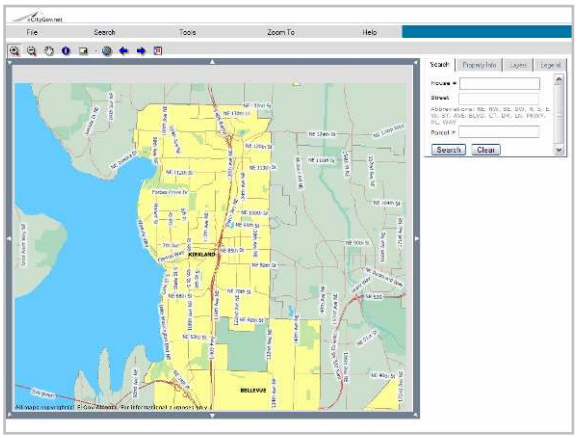
- An environmentally sensitive areas data set is not available in all areas, and is incomplete. Consultants provide surveyed data as part of permits on wetlands, but the point put on the paper map just has a note as to which permit documents it is described in. Planning would rather see the legal description entered into base map with dates, etc.

- As with other departments, Planning expressed a concern that the Advantage-to-GIS Browser link needs to be two way, or at least be able to view permits in the GIS Browser and pull up basic information.
- Reporting is predominantly geographic in nature, yet there is not an up-to-the-hour GIS layer that shows permits, etc.
- Online tax assessor maps viewable in a browser window would be a real time saver.
- There is no available GIS layer of current development projects.
- Much of the data is by census geography (including Transportation Analysis Zones [TAZs]) but many reports need neighborhood level statistics. Census boundaries are extremely inaccurate compared to neighborhood boundaries, so aggregation of census data based on GIS overlay analysis tools is highly problematical.

# I. REGIONAL ISSUES

There are a variety of regional ("Eastside") initiatives under way that involve the city of Kirkland GIS program. The **eCityGov** is the primary one, although agreements are in place with other cities for data sharing, e.g., service agreement with City of Mercer Island and Medina for street data.

## eCityGov



The general consensus among eCityGov members is that existing GIS data and services do not meet their needs at a regional level. A primary eCityGov goal is therefore to develop a regional GIS Browser to be hosted at the city of Bellevue. This means building a central data repository for standardized key base map layers like streets, parcels, addresses, and orthoimagery.

The Regional GIS Browser is currently in testing, and is a comprehensive platform for public access web mapping. Kirkland IT wants it to be the only public access browser with its own portal address; each city will also have capability to customize the interface and tool set.

The city managers of member cities form the board for eCityGov and expressed a desire for regional GIS. The Regional Browser meets that need as the first of a series of regional business applications utilizing GIS. In future there will be a centralized address registry, for which the eCityGov GIS subcommittee has come up with address standards that are required to facilitate this.

www.KirklandPermits.net and www.KirklandParks.net will eventually be replaced by these applications. The Browser is being written using

ArcIMS, ArcSDE, SQL Server, and ASP.NET and will be released in June 2005.

The biggest issues are with data sharing. The portal starts with King County data as a base, and then it augments that with local data where available. For Kirkland, the data will be the high quality layers from the GIS. Data manipulation is done using Safe Software's FME.

Integration efforts have been different for each subscriber, e.g., Snohomish County took 4 months total implementation time and the 2.5 hour wait lines for $25 permit are now gone. Back end integration is done using XML Web services, data dumps, CD, FTP; basically whatever needs to happen with whatever frequency necessary to "plug in" third-party applications like permitting and CMMS.

Because of this the member cities may in the future synchronize choosing new vendors. This makes regional efforts easier because the transaction layer on top of each vendor system only has to be written once for multiple jurisdictions. Contracts also can be more effectively negotiated, adding language like "this contract covers any alliance city", and by using only floating licenses. Most hosting and project management responsibility will be assumed by Bellevue.

The eCity Gov organization has only one full time employee. City staff (almost exclusively Bellevue) have been contracted back to get the actual work done. Resources are also split. For example, each subscribing city is buying 20% of a DBA. At a regional level cities are open to resource sharing, e.g., borrow a programmer for a while. A service bureau approach has been considered but rejected. However, Bellevue and Kirkland are already doing a little of that internally.

### GIS Issues

- The Regional Browser is an excellent platform built using the same technologies as Kirkland uses. However, until it is finalized, the degree to which city-specific customization can be made remains an open question.
- The reliance on Bellevue GIS application developers has worked up to this point, but there is the potential for conflicts of interest. Bellevue programmers assigned to eCityGov development could relegate Kirkland issues to a lower priority in favor of other alliance member requests.
- Multiple Kirkland departments want a public-facing map-based Web presence. How quickly can the Regional Browser support that presence, and can Hansen and Advantage be incorporated?

## J. CITY MANAGER'S OFFICE

The City Manager is extremely happy with GIS and knows that the GIS Division has made great strides with limited resources. The key is that there are tangible products coming out of the program, and it is not just

an expensive data building exercise. GIS also has good customer service reviews from the departments by generally doing an excellent job of balancing priorities and competing demands.

He sees the use of GIS in the field as a real productivity enhancement, and cites the case of surface water data collection as a case in point.

He espouses E-Democracy – that is, engage people more often in virtual meetings, online surveys etc. For example, a road may be proposed with some alternative designs. These should be put in a public map browser with tools to interact (redline / draw) with the map to suggest ideas.

## GIS Issues

- The City Manager expressed concern that creating simple maps is not the highest and best use of GIS analyst's time, and tools should be available to let employees create and print their own basic maps.
- He is concerned how GIS is going to grow within current budget constraints.
- The CMO does not see GIS in the field as much as is possible.
- The "neighborhood hot sheets" were among the most popular web pages on the city's site, showing a summary of activity in any one of the city's 13 neighborhoods. The City Manager knows that GIS can support this type of content, but doesn't see it happening.

# 3. NEEDS ASSESSMENT AND GAP ANALYSIS

Based upon the interviews and information summarized in the previous section, this section describes general statements of need arising from the current (*status quo*) organization and use of GIS at the city. A vision for GIS is outlined that satisfies those needs, followed by an analysis of gaps between the current situation and the vision.

## NEEDS ASSESSMENT

### General Statements of Need

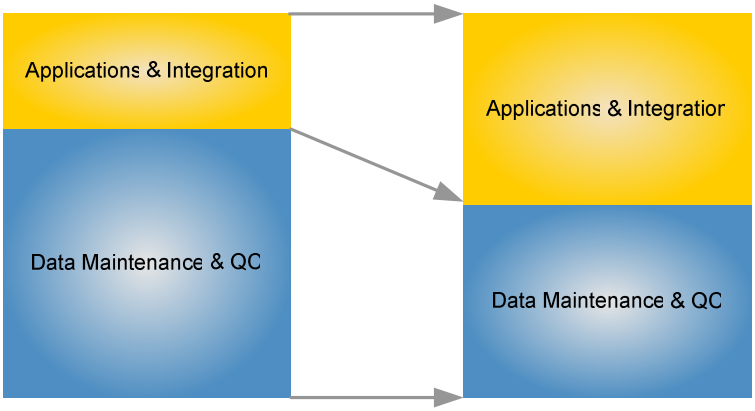
#### A Shift in Focus

Before listing specific needs, some general ones can be stated. The overriding need is for the city GIS to make the transition from a data-centric organization to a more application and integration focused model.

The city has invested in high quality data layers to support GIS. The time has come to **leverage that investment in data to support decision making and analysis**. This is accomplished by sharing data across departmental boundaries in an integrated fashion, and this is accomplished through a well organized, centralized set of GIS initiatives.

This is not to say that the shift is overdue, just that the timing is right now that the activities of the 1998 LBIS Plan are drawing to a close:

**Figure 8 – Strategic Change in Focus**




This will support a major goal of the City Manager's Office, among others, which is greater involvement of the public in City decision making. Creating systems, tools, and applications that use the great core layers was the original goal of GIS at its inception. Using a variety of approaches to reducing data maintenance time, the GIS Division can move the program to the next level, i.e., building "spatial knowledge"

into key city business applications and business processes like CIP planning and public safety.

With this as a central direction, other general needs arise such as a revised approach to providing funds for the GIS program, potential reorganization of staff, decisions about the level to which outside consultants should provide specialized or one-time services, and so forth.

## Centralized GIS Organization, Data, and Technology

Centralization is another general need that is evident from the interviews and examination of documents provided. There are some differing schools of thought of how to structure GIS within a municipal organization, and the city has chosen a centralized model with some degree of GIS within the departments. Alternative approaches such as having a GIS Analyst in each department are not cost effective for a city the size of Kirkland; it leads to more project oriented GIS rather than an IT centric enterprise GIS approach. Any time IT or GIS is more tactical than strategic, the costs increase due to replication of services, data, and staffing resources. For this reason, the original decision to house GIS as a division in IT remains a good one.

So, as a function of the first phase of GIS implementation—data development—the centralized model has been extremely effective. Linking GIS to applications like Advantage, NewWorld, and Hansen, has demonstrated the need to have high quality GIS data. In this regard, the Steering Team-work plan approach has enabled a small group to accomplish a remarkable amount in only a few years. In order to support this existing need for data, there must be a strong technological base of data servers, application servers, and GIS automation tools (often called "geoprocessing"). These are not yet in place to the degree that the next phase of implementation—enterprise GIS—will demand.

## Financing GIS

The City of Kirkland is looking for a fair and equitable method to determine how each of the departments will contribute to the next phase of GIS development. In the 1998 Plan a methodology was developed that ensured an equitable division of funding between departments based upon the type of data layers being developed. In this way, the Public Works Department could use utility funds to pay for the creation of water, sewer, surface water, and other layers. By contrast, the other departments helped with the cost of more general purpose "core layers" like streets and addresses from the General Fund. Furthermore, the rate model used by IT was adopted for all non-capital project work like ongoing GIS analysis and mapping projects.

To realize the goal of getting the production GIS data in the hands of the public, city staff, and regional organizations, there will be a significant application development effort in this second phase of GIS. This plan

will provide specific recommendations as to how the current GIS budget model can be altered to meet these changing needs.

### Public Involvement

A major, or perhaps *the* major, reason in starting the GIS program was to improve service to the public. This has unquestionably been achieved with process automation and information sharing using GIS. However, the public is still one step removed from the benefits of the program; while they can come into a service desk and look at information in the GIS Browser, or attend a Planning Commission meeting and see a proposed development, they cannot access city information by themselves. This is inefficient for the residents of the city (who are seen as technically "savvy") and also for city staff who must get information to residents.

## Specific Needs

Evaluating the information obtained from conversations with the GIS Division and other city staff produced a list of key needs. Using the interview notes, Woolpert created a list of categorized key information management needs. Following is a table listing the codes used for abbreviating divisions followed by a table listing prioritized needs with priorities and comments.

**Table 6 - Needs Assessment Codes**

| Code | Department/Division |
|---|---|
| GIS | GIS Division |
| PW | Public Works |
| PL | Planning |
| FD | Fire and Building |
| PD | Police |
| FN | Finance and Administration |
| PK | Parks |

**Table 7 - Specific Needs**

| Category | Need | Departments | Priority | Comment |
|---|---|---|---|---|
| Data | Completed utility layers | PW, GIS, FD, FN | 1 | |
| | Environmentally Sensitive Areas | PL, FD, PW, GIS | 2 | |
| | City Owned Property | PW, PL, FN, PK, GIS | 1 | |
| | Survey Vertical Control | PW, GIS | 1 | |
| | Extended coverage of non-City areas for Fire Department | FD, GIS | 1 | |
| | Easement | PW, PL, FN, GIS | 1 | |
| | Manage specialized Fire data in ArcSDE | FD, GIS | 2 | |
| | | | | |
| Organization | Centralized GIS Division | GIS | 2 | |
| | Effective GIS Department Representatives | GIS | 2 | Wide variety of experience and capability - standard training to become Departmental GIS Rep. |
| | New Resource / Resource Allocation | GIS, PW | 1 | |
| | Revised budget allocation model | All | 1 | |
| | | | | |
| Application | Enhanced internal GIS Browser | All | 1 | Capabilities well understood from current Internal GIS Browser, but rewrite necessary. |
| | Centralized Address Database and Web Service | All | 1 | |
| | Automated NewWorld export and geocode | PD | 1 | |
| | Automated Hansen export and geocode | PD, PW | 1 | |
| | Automated Springbrook export and geocode | FN, PW | 1 | |
| | Automated Advantage export and geocode | PL, FD, PW | 2 | Depends on system replacement schedule |
| | Intranet crime mapping tool | PD, GIS | 2 | Depends on NewWorld extract and geocode |
| | Desktop GIS crime analysis | PD, GIS | 1 | Evaluation of software already in progress |
| | GASB34 Reporting Tools | FN, PW, GIS | 1 | |
| | CLASS Registration with Address | PK, GIS | 1 | |
| | Public Mapping Web Page | All | 1 | Phasing depends on Regional GIS Browser completion |

| | | | | |
|---|---|---|---|---|
| | Automated Data Processing / Reporting for Planning | PL, GIS / All | 1 | |
| | | | | |
| Management Systems | Centralized project management with GIS location | PW, GIS | 2 | |
| | GIS data update and project request | GIS | 1 | Embed business rules in project request, e.g., maximum 2 revisions to custom map |
| Operational | Implement centralized geodatabase | GIS | 1 | Partially complete - ArcSDE is in place. |
| | Current addresses for Advantage | PL, FD, PW, FN, GIS | 2 | Process in place, frequency in question |
| | Current GIS data for Hansen | PW, GIS | 1 | Process in place, frequency in question |
| | Current addresses and streets for NewWorld | PD, GIS | 2 | Process in place, frequency in question |
| | Streamline data maintenance and QC procedures and tools | GIS | 1 | |
| | Streamline map book and custom map generation. | GIS | 1 | Tools exist but need additional development effort. |
| | | | | |
| Field | Access to GIS data in the field | All | 1 | |
| | Field crews access and capture maintenance data | PW, FD, GIS | 1 | |
| | | | | |
| External Data or Procedures | Provide map ready data to eCityGov | GIS | 2 | |
| | CAD Standards | PW, GIS | 3 | |
| | Fire data export for Bellevue Dispatch | FD, GIS | 1 | |

## Summary of Needs

The above needs represent the most important issues to the city—they signify new and improved use of GIS information and technology at the department or work group level. However, identifying the *need* does not in itself describe the required *action*, such as business process re-engineering, that will satisfy the need. Such actions, collectively, are the improvements that are necessary to achieve the city's goal of capitalizing on integrated information systems. For instance, it can be shown that there is a need for an application displaying the location of all Public Works activities in the city; this requires an action, i.e., that someone to take responsibility for recording and revising data for each activity in a GIS-compatible form. The required actions comprise "gaps" between the GIS *status quo* and the ideal scenario, as described in the Six Year Plan Vision.

# THE SIX YEAR PLAN VISION

The purpose of the GIS Strategic Plan is to create a schedule, budget, and resource roadmap by which the needs of city staff and community are met. This implies a vision of where the city wants to be over the next six years and how GIS ties into that vision. By its nature this is a set of general statements that are not specific, but rather describe the overall goals of the city GIS.

- **Public Access** – The overriding vision for GIS six years from now is a well integrated, up-to-date platform that improves service to the residents of the City of Kirkland. To that end, a Web portal accessible by residents will be available to share timely information, solicit feedback on issues and projects, and generally give city residents a better understanding of what the City of Kirkland government is doing for them.
- **GIS Organization** – As a discipline, GIS is increasingly becoming a specialized type of IT function. All city GIS analysts should be located in the IT Department. GIS users should be empowered through tools and training, and be located throughout the city's multiple departments.

  Public safety functions (primarily Fire and Police) should have a dedicated GIS analyst in the IT Department. Apart from serving those departments, a new position will free up resources to meet the needs of other departments.

  This GIS Division should continue their annual GIS Work Plan management approach under the auspices of the GIS Steering Team, and utilize consultants for large data creation or application development projects.

- **GIS Data** – The major data layers already identified as "core" layers should be completed, stabilized, and in maintenance mode at the earliest possible time. Additional key layers will be developed and maintained to support decision making processes that have surfaced since the originally 1998 Plan. Data maintenance and QC will take no more than 50% of each GIS analyst's time.

  Any city employee with a laptop and occasional connection to the Intranet will have the opportunity to load a complete collection of map layers using free viewing software. Where appropriate, certain staff will have the capability to edit or "redline" suggested data changes while in the field.

  Outside consultants should be used for initial data development projects, whether to complete projects in their entirety, or to manage city staff in data collection. Both approaches have been effectively used in the past, and the model should be extended to the future.

- **Application Integration** – Each of the critical city business systems should be fully integrated with GIS data and / or applications as appropriate. When an address is used by any business system it should be coming from a centralized address database maintained by GIS. When a utility asset is included in a GASB34 report it should come from the GIS database maintained for Public Works by GIS. As project engineers plan CIP work,

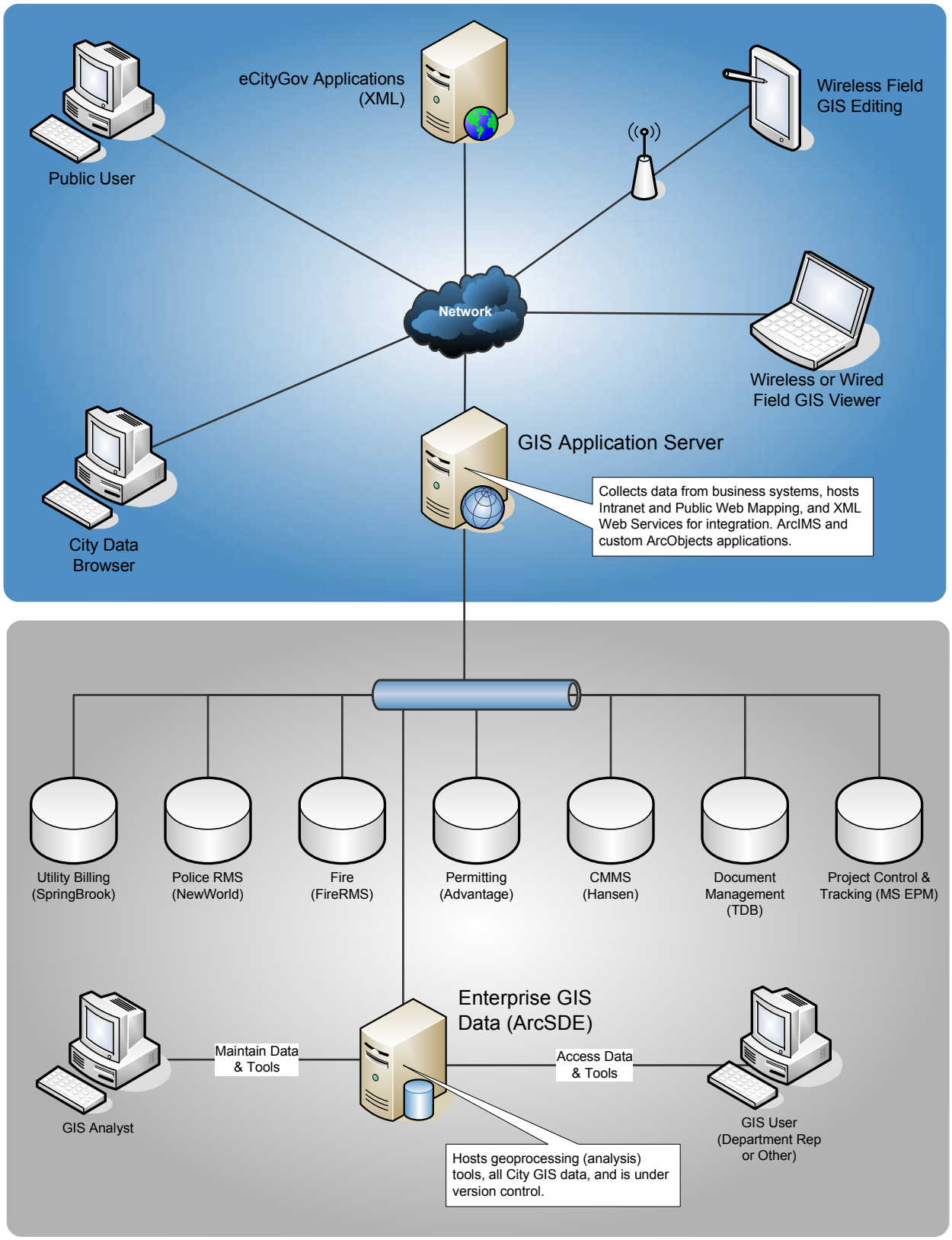
the location of those projects should dynamically show on maps that city staff and the public can access. As applications come up for "upgrade or replace" decisions, integration with GIS should be a primary decision driver. For example, when the upgrade from Hansen v7 to v8 comes around, the costs and level of GIS integration should be used to evaluate Hansen v8 vs. other vendors at that time.

Because the focus of the IT Department as a whole is not on application development, initial requirements gathering, software design, and development should be done by outside consultants in all but the simplest cases. As with non-GIS systems such as IFAS, this approach has yielded good results for the city in the past

- **GIS and IT Standards** – All GIS data and applications should rely on standards-based software, tools and methodologies. This generally lowers the maintenance burden on IT staff for things like operating systems (Windows XP, Windows 2003 Server), database server platforms (Microsoft SQL Server), and development environments (Microsoft .NET). For GIS this means continued use of the ESRI product line (a *de facto* industry standard), and fully adopting the enterprise Geodatabase approach for data management, maintenance, and modeling.
- **Decision Support** – With the completion of the 1998 LBIS Plan, GIS at the city should be supporting decisions within the city by leveraging the data that has been created. With the help of GIS analysts, models and tools should be created to support useful, in depth analysis to improve the way that the city does business. A new Intranet GIS Browser will provide quick access to a wide variety of data, reports, and tools for any city employee to access.

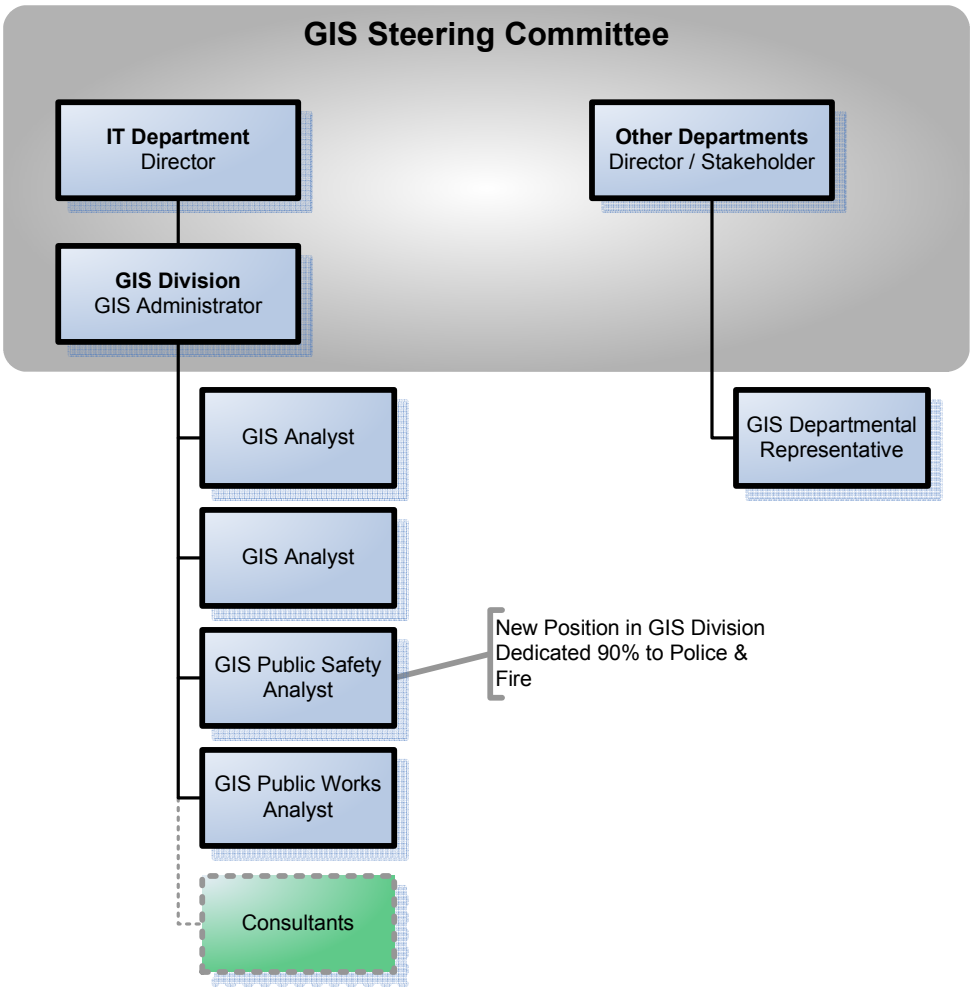
Figure 9 shows a basic representation of the systems that support this vision. The two enabling components are the Enterprise GIS Data Server and the GIS Application Server. The Data Server hosts not only all of the GIS data for the city, but also custom models and tools written by the GIS Analysts that can be run by any GIS user connected to the server. The Application Server runs custom data gathering processes to pull critical business data from existing systems like Hansen, Advantage, and Springbrook. These are then used to support a wide variety of information consumers like members of the public, regional applications (eCityGov), and city staff both in the field and in the office.

**Figure 9 - GIS Vision**



In support of these systems, the GIS Division will be consolidated to provide an excellent level of service to all departments, with dedicated resources to those departments with the largest data maintenance and analysis requirements. The Steering Team will continue to have oversight of all GIS project focus and phasing, while the departmental representatives will be trained to provide a base level of GIS service within their respective departments. Consultants will continue to provide one-time services on large capital projects such as application and data development.

**Figure 10 - GIS Organization**




# GAP ANALYSIS

This section compares the needs assessment results with the proposed goals of the Six Year Plan Vision. Any differences between the current status of processes and what the vision recommends are identified as gaps that must be considered and, if justified, closed.

In order to make this analysis compatible with the existing IT Strategic Plan, a similar template is used. Both applications and issues are

identified using this approach. To aid comparison, gaps are also listed in the same order as the recommendations in Section 4.

Example:

| **Application/Issue Name** | |
|---|---|
| Ideal Application / Process Description: | The description of the application from the ideal application architecture. |
| Benefits: | The expected benefit to be gained from the ideal application. |
| Existing Applications / Process: | The name(s) of existing applications that provide functionality in this area. |
| Gap Analysis Summary: | A description of gaps in the ability of existing application(s) to support necessary business processes. Areas investigated include:<br>• Functionality – The ability of existing applications to support necessary business processes<br>• Ease of Use – Issue with regards to comprehensibility and usability of the corresponding applications<br>• Data Sharing – The ability of corresponding existing applications to provide flexible data access<br>• Standardization – The level of standardization of data formats, programming languages, and platforms of the corresponding applications |
| Overall Gap Assessment: | A rating of the level of current automation support as compared to that supplied by the ideal application:<br>• "Minimal" indicates a well automated application/data/process<br>• "Moderate" indicates that some gaps exist<br>• "Severe" indicates that the existing applications/data/processes do not automate the function well, or that no application exists |

## Organizational and Operational

| *1. Financing GIS* | |
|---|---|
| Ideal Application / Process Description: | Each department will be responsible for an equitable portion of the cost of implementing the next phase of GIS at the City. This burden of cost will take into account the degree to which each department benefits from the data (maintenance) and applications that are part of the plan in both the initial development (capital projects) and maintenance (utility/general funds) phases. The Annual GIS Work Plan will provide each department with a budgetary figure consisting of estimates using the IT rate model, plus that department's percentage of capital projects, e.g., development of a new data layer. |
| Benefits: | The budget for GIS will be fairly divided between each department based upon the level of service expected via data and applications. |
| Existing Applications / Process: | The budget process defined in the 1998 Plan is the same as that described above. |
| Gap Analysis Summary: | The current budget approach is geared towards data rather than a mix of data and applications. |
| Overall Gap Assessment: | **Moderate** |

| *2. GIS Organization* | |
|---|---|
| Ideal Application / Process Description: | The GIS Division provides a central clearinghouse for all GIS data, applications, analysis, and training. Departments will work with individual analysts through Work Plan Projects as identified by the Steering Team. Two analysts will have job responsibilities that focus the majority of their time on Public Works (moved position) and Public Safety (new position) respectively. |
| Benefits: | Organizationally this focuses all experience and knowledge about advanced GIS into one location, making management, cross training, load balancing, and budgeting simpler and more effective. |
| Existing Applications / Process: | Extensive GIS analysis / data maintenance is carried out by Public Works and Fire and Building Department staff. All other GIS is centered in IT. |
| Gap Analysis Summary: | The GIS staff are already working at 100% capacity. Even with time saving process automation, this is unlikely to change because of additional layer maintenance recommended by this Plan, so they will not be able to complete the basic work needed to advance GIS in the City. Resource leveling across Departments is another facet of this problem. |
| Overall Gap Assessment: | **Moderate** |

| *3. GIS Service Support* | |
|---|---|
| Ideal Application / Process Description: | Every request for a data update, map project, or request for analysis will be logged and tracked through a purpose built Web based project request system. The GIS Administrator will use the system to assign projects to analysts, keep staff apprised of progress, and effectively track time spent on projects. Completed mapping projects will have a PDF version of the finished document associated with them for future reference. |
| Benefits: | Better prioritization of projects for a limited group of analysts to work on. Better tracking of time spent on projects, leading to more accurate application of the IT rate model. Better customer service with progress feedback, track data changes, and electronic map library. |
| Existing Applications / Process: | There is a highly structured process in place for requesting work. |
| Gap Analysis Summary: | The current *process* is not supported by an easy to use and manage *tool*. Without such a tool, there is a tendency to bypass the process and every project can become a "priority". In addition, there is no good feedback mechanism for staff to find out the status of their project, update request, or analysis as well as retrieving digital maps automatically. |
| Overall Gap Assessment: | **Severe** |

| *4. GIS Skills and Expertise* | |
|---|---|
| Ideal Application / Process Description: | Within the GIS Division there should be a good mix of data maintenance, cartography, analysis, and application maintenance skills. Departmental Representatives will provide a first line of support for basic mapping requirements. |
| Benefits: | The Division can respond to all types of requests for service, and with cross training can do so even when the "right" Analyst is not available. Workload for "technician" level projects will diminish as Departmental Reps support simple requests. |
| Existing Applications / Process: | GIS Division staff are well versed in data maintenance, cartography. Analysis is limited because of time constraints. Capabilities of Departmental Reps varies widely. |
| Gap Analysis Summary: | GIS Division staff are not capable of supporting advanced applications that may be created by consultants. Knowledge of ArcGIS 9.x geoprocessing is limited. In some cases Departmental Reps are not trained to be self-sufficient resources for their departments. |
| Overall Gap Assessment: | **Moderate** |

## Applications

| *5. Internal GIS Viewer* | |
|---|---|
| Ideal Application / Process Description: | The GIS Browser rewritten in a modern programming language with extensibility and maintenance in mind, this ASP.NET Web application will be available to any City employee. It will have all of the existing capability in Phase 1, plus high quality map output. Phase 2 includes integration of Hansen, Springbrook, NewWorld, and Advantage information, CIP locations, redlining tools, network tracing on utilities, and an address mailing list wizard. All versions will incorporate Windows-based security to control access to sensitive data – this supports the publishing of crime data in the viewer for Police Officers. |
| Benefits: | Very easy access to the majority of GIS data available within the City, including key tools that are much in demand like a GIS view of work activity, and good looking maps via a web browser. |
| Existing Applications / Process: | The current GIS Browser is an incredibly popular Web page built using ArcIMS, HTML, and JavaScript. It is supports simple display and query of layers. |
| Gap Analysis Summary: | The lack of quality of map output is a prime reason why so many requests for simple maps come to the GIS Division. Critical layers like CIP locations are not available at all in the City. |
| Overall Gap Assessment: | **Severe** |

| *6. Public GIS Viewer* | |
|---|---|
| Ideal Application / Process Description: | A simple GIS Viewer where anyone inside or outside the City can access base map layers (TDB) and City activities like service requests, crime reports, permits, and CIP projects. Each neighborhood will have a summary "hot sheet" available. Potentially **leverages the Regional GIS Browser** (ArcIMS, ASP.NET) if this can support City requirements for customization and data integration. |
| Benefits: | Part of an e-Democracy initiate, this lets City residents participate in government by understanding what activity the City government is undertaking at any given time. |
| Existing Applications / Process: | There are a variety of Web pages where the public can look at some form of local mapping, but these will eventually be replaced by the Regional GIS Browser. |
| Gap Analysis Summary: | Existing Web mapping sites do not incorporate the activity information that the public is interested in. |
| Overall Gap Assessment: | **Moderate** |

| *7. Crime Analysis* | |
|---|---|
| Ideal Application / Process Description: | The Crime Analyst in the Police Department will be able to quickly perform complex and useful analysis to determine patterns and causes of crime within the City. The analysis tools will be strongly tied to GIS software and GIS data, and be specifically geared towards law enforcement needs, e.g., hot spot mapping. |
| Benefits: | More timely, actionable information will be available to officers, including detectives. Patterns that are not discernable in text reports will become apparent when viewed and analyzed in a map context. |
| Existing Applications / Process: | Shapefiles (GIS layers) for analysis are created by creating a map report in NewWorld, exporting the information to Excel, then *re*-geocoding the data in ArcGIS Desktop. Simple thematic maps and pin maps are created for officers. |
| Gap Analysis Summary: | Using data from the NewWorld system for spatial analysis is very labor intensive, to the point where GIS analysis is not used as often as it could be to support day-to-day reporting and analysis requirements. |
| Overall Gap Assessment: | **Severe** |

| *8. Enterprise Geodatabase* | |
|---|---|
| Ideal Application / Process Description: | The ArcSDE for SQL Server data server should house *all* core data layers, all metadata, numerous geoprocessing models, and support versioning, topology, geometric networks, and imagery. |
| Benefits: | The enterprise geodatabase supports disconnected editing for field use, much better network performance vs. file based GIS data, easier administration, more accurate data (using topology and geometric networks), and a more fault tolerant approach to data maintenance and editing using versions. Models (automated routines) can be housed in the central server for any GIS user to access without needed to know the technical details of the model, e.g., generate a refresh of data to give to a consultant, export new street data for Dispatch. |
| Existing Applications / Process: | A variety of shapefiles and personal geodatabases are used for most data maintenance. The exception is real property and the aerial photos which are already in ArcSDE. |
| Gap Analysis Summary: | The current partial implementation is a major detriment to efficient data maintenance and QC. Using file based data for any Intranet / Internet application is not scalable as it is with a database back end. Numerous file copies and transfers ("manual versioning") are used instead of robust database versioning. |
| Overall Gap Assessment: | **Severe** |

## Technical GIS Issues

| *9. GIS Layer Maintenance and QC Tools* | |
|---|---|
| Ideal Application / Process Description: | In support of the maintenance and QC processes, very focused tools in ArcMap and ArcCatalog will be available to GIS Analysts for specific tasks like automated data entry, composite feature placement, automated rule-based QC reporting, and network flow direction calculation. Implementing CAD standards will ease the burden on the GIS Analysts as they pull new data from as-builts for the maintenance process. Implement the Maplex annotation automation tool. |
| Benefits: | Faster initial data entry time, and much faster data QC lead to an overall decrease in the time taken to keep layers up to date. |
| Existing Applications / Process: | Processes are very well documented and adhered to, and there are some custom tools to support the processes, e.g., Traverse Tool for real property editing. The majority of maintenance and QC uses standard ArcGIS Desktop functionality. |
| Gap Analysis Summary: | While ArcGIS tools are a good starting point, they are not well organized or focused enough for high throughput maintenance and QC. The analysts spend an inordinate amount of time on tasks that can be either partially or fully automated. There are no CAD standards in place, which further increases the time taken to edit the utility and real property layers. Some consideration should be given to the tradeoffs between imposing mapping standards on city customers versus savings realized in corresponding GIS updates. |
| Overall Gap Assessment: | **Severe** |

| *10. 3D GIS* | |
|---|---|
| Ideal Application / Process Description: | GIS Analysts can create virtual models of the City, or parts of the City, using building footprints, tree inventory and other layers to demonstrate how a development will impact the City, e.g., a new office building. |
| Benefits: | This enables better decision making from a planning and development perspective prior to issuing permits, acquiring new land for a park, and so on. |
| Existing Applications / Process: | N/A |
| Gap Analysis Summary: | There is no existing 3D GIS capability. This is not difficult to get started, but with all other GIS Division activities for attention and has therefore not been tackled up to this point. |
| Overall Gap Assessment: | **Severe** |

| *11. GASB 34* | |
|---|---|
| Ideal Application / Process Description: | The annual GASB 34 reports should be driven directly from the enterprise GIS, since this is the best single source of asset data in the City. A reporting tool will simplify the process of Accounting making a connection to the GIS, retrieving asset value information (installation date, pipe diameter, etc), and generating Excel output based upon standard accounting models. |
| Benefits: | The creation of the annual GASB 34 report(s) will be much easier and more accurate. |
| Existing Applications / Process: | Summary data was extracted from GIS, processed by the GIS Public Works analyst, and information was loaded into an Excel spreadsheet. Engineers let Accounting know when a capital project has been completed, and include a cost summary. |
| Gap Analysis Summary: | The link to GIS does not exist – it was a one time download of data. The process by which PW informs Accounting of completed projects is not fully defined, so updates cannot be incorporated efficiently. |
| Overall Gap Assessment: | **Moderate** |

| *12. GIS Layer Maintenance and QC Process* | |
|---|---|
| Ideal Application / Process Description: | Depending on their level of GIS skill, and predetermined editor roles, users should be able to suggest updates or additions to GIS layers directly in ArcMap or ArcPad (field or office), or through a Web browser using redlining tools. These suggestions will be reviewed by GIS using an update tracking system, and appropriate updates will be made against an ArcSDE version. QC will be performed against the version, and then the Administrator will post the changes to the product ArcSDE database. |
| Benefits: | Whether a GIS user (ArcMap, ArcPad), or consumer of data (as in the GIS Browser), there will be a well defined and *trackable* data update request process for staff to use. On the GIS Analyst side, a reworking of the maintenance and QC process will increase the speed with which requests can be reviewed and incorporated into the production system. |
| Existing Applications / Process: | A variety of methods are used to communicate data updates to the GIS Analysts, including e-mail, printed maps with notes drawn on them, and redlined as-built drawings. |
| Gap Analysis Summary: | While there is a very structured approach to handling maintenance and QC within the GIS Division, not using the enterprise geodatabase makes the process more complicated than it should be. There is no formal update request process in place. |
| Overall Gap Assessment: | **Moderate** |

| *13. Advanced Planning Reports* | |
|---|---|
| Ideal Application / Process Description: | A variety of advanced map based and non-map based reports will be automated for the Planning Department. These will include census reporting based upon non-standard areas (like neighborhood or business district), land capacity, spec sheet maps for economic development opportunities. A combination of Geoprocessing tools and a desktop map wizard enable planners to run these reports themselves. |
| Benefits: | Planners will have real time access to key reports without having to send a request to the GIS Division. They get their information much faster, and the GIS Analysts can focus on more value added activities like advanced GIS analysis. |
| Existing Applications / Process: | A previous GIS consultant has performed advanced reporting for the Planning Department in the past. With the departure of the consultant, less advanced reporting has been done, and the Department has focused instead on using GIS primarily for mapping rather than analysis driven reporting. |
| Gap Analysis Summary: | The exact process by which the GIS consultant created the reports is not well documented. There can be a lag time between needing a mapping report, and getting the product. |
| Overall Gap Assessment: | **Moderate** |

| *14. Enterprise Document Management System (EDMS)* | |
|---|---|
| Ideal Application / Process Description: | The EDMS should support direct access from both ArcGIS Desktop and custom .NET applications through either database, XML, or both approaches. A GIS user can click on any feature in the GIS and see a list of documents (if any) that are associated with that feature. Documents can be assigned to features through a GIS interface. Custom programs written using .NET can access the database or XML service to find documents given GIS feature(s). |
| Benefits: | Any GIS desktop or browser user will have instant access to document information about map features, e.g., the original scanned plat from which an easement was created. |
| Existing Applications / Process: | N/A – There is an RFP in progress at the time of writing for a new EDMS. |
| Gap Analysis Summary: | The current RFP does not adequately define the touch points between GIS and the EDMS. |
| Overall Gap Assessment: | **Moderate** |

## Data

| *15. Required Layers* | |
|---|---|
| Ideal Application / Process Description: | All major business processes should have the necessary supporting data: utilities, real property, streets, address, census geography, environmental data, City activities (permits, service requests, workorders, calls for service). These data should be up-to-date |
| Benefits: | Reports and analysis using GIS will return valuable, actionable results. |
| Existing Applications / Process: | N/A |
| Gap Analysis Summary: | GIS analysis tools need to be applied to accurate, current, complete, and comprehensive data layers. Through the needs assessment several significant GIS data sets were discovered to be lacking/missing: ESAs, easements, good vertical control, and city owned property. |
| Overall Gap Assessment: | **Moderate** |

| *16. Automated Activity Layer Creation* | |
|---|---|
| Ideal Application / Process Description: | Layers will exist in the enterprise geodatabase to show City activity from Hansen, Springbrook, Advantage, FireRMS, and NewWorld. Automated data extract, geocode, and update routines will run as Windows services to keep this layers refreshed on a nightly basis. |
| Benefits: | These layers are central to many of the view, query, and decision making processes at the City. By having them as GIS layers means that some data from the key business systems can be accessed via a map to support things like simple graffiti mapping, crime analysis, land capacity analysis, Internet/Intranet browsers, etc. |
| Existing Applications / Process: | These layers do not currently exist. Subsets of data from systems are extracted and geocoded on an as needed basis to support projects. |
| Gap Analysis Summary: | A variety of GIS projects that were described as desirable or critical (e.g., GIS-to-Advantage link) are not possible because no “City activity” layers exist. |
| Overall Gap Assessment: | **Moderate** |

| *17. Master Addressing* | |
|---|---|
| Ideal Application / Process Description: | All business applications will use a single source of address information derived from the GIS sources. This information will be presented through a series of XML Web Service interfaces, including but not limited to FindAddress, FindIntersection, AreaIdentify (point in polygon search). The system will rely on ArcObjects for geocoding. For systems that do not yet support Web services, more automated GIS data export procedures will be created using ArcGIS Geoprocessing. The best candidate for initial Web service integration is the CLASS Account Request Web page to automatically determine whether an address is in the city or not. |
| Benefits: | Applications will use the best source of address data that is available in the city because the GIS addresses are maintained through a rigorous QC process. If only good addresses are being used, there is a high degree of confidence in the information in the business systems, and GIS analysis if much easier. |
| Existing Applications / Process: | Addresses and streets are exported on a regular but infrequent basis. The derived data is pushed in to other systems, notably Advantage and NewWorld. |
| Gap Analysis Summary: | All access to address lists in Advantage, NewWorld, Hansen, and Springbrook is via batch loaded addresses that are between two and six months old. These systems are not capable of connecting to Web Services, so the current solution is good. However, as GIS becomes a more central asset for city business, tighter links between new/existing applications should be developed. |
| Overall Gap Assessment: | **Moderate** |

| *18. Field GIS* | |
|---|---|
| Ideal Application / Process Description: | Any city employee with a Windows laptop should have read-only access to all enterprise GIS data (this does not include sensitive data such as certain crime locations) when not connected to the city network. Static data views are supported by Adobe Acrobat files (PDFs), while dynamic view and query are supported by the free ArcReader software from ESRI. Network connected users can access the Intranet GIS Browser, and key users can license either ArcEditor or ArcPad for disconnected field editing of the enterprise Geodatabase. |
| Benefits: | Field GIS will increase of quality of information that they are using on a daily basis, thus streamlining work. As the people closest to the real world things being tracked in GIS, they can also provide field verification and feedback on the quality of the GIS data. |
| Existing Applications / Process: | GIS data is used in the field in a limited way, primarily during utility asset data collection. The other method is to use the hard copy atlases created by the GIS Division. |

| | |
|---|---|
| Gap Analysis Summary: | Paper maps are out of date as soon as they are printed, and become an unofficial repository for field notes (redlines) that are hard to get back in to the GIS. In addition, the cost of producing atlases for field is high. Part of the gap is because of the cost of network and for real-time field GIS. The cost of network access is a barrier since it's a fairly high ongoing cost. |
| Overall Gap Assessment: | **Moderate** |

| ***19. Extent of Core Layers*** | |
|---|---|
| Ideal Application / Process Description: | Each core layer should cover the area required by each City department using that layer. |
| Benefits: | The operational and analytical functions of each department are fully supported by GIS in centrally managed layers. |
| Existing Applications / Process: | With the exception of the Fire Department, each City department's needs are being met now, or will soon be met with the completion of the 2005 work plan. The Fire Department maintains a large quantity of GIS data separate from the GIS Divison, in particular streets, address, edge of pavement, and hydrants. |
| Gap Analysis Summary: | The Fire Department does not have high quality, City-maintained street and address data for their service area that extends beyond the city limits. These data are critically important for the FD since regular updates must be sent to Bellevue Dispatch. |
| Overall Gap Assessment: | **Severe** |

## Other Gaps

As part of Woolpert's investigation into the needs of the City, we were given the opportunity to note areas that are not necessarily purely GIS related, if the need was obvious. Only one case was readily apparent—that of project management at the City.

| *20. Citywide Project Management* | |
|---|---|
| Ideal Application / Process Description: | As projects (e.g., CIPs) are planned and projects are initiated, a centralized project management system is used to enter timeframes, schedules, resources, project location, and contacts. Using standard toolsets like Microsoft Project, Outlook and Excel, project engineers can do their work, while other city staff can use a Web browser to get a summary view of what is happening within the city. |
| Benefits: | Day-to-day project management will be more efficient and easier, intra- and inter-departmental development coordination will be possible, and planning future CIPs will be greatly enhanced. |
| Existing Applications / Process: | A variety of spreadsheets, notes, and databases are used to track projects. |
| Gap Analysis Summary: | Apart from a single dry erase status map, there is no spatial representation of where projects are occurring in the city. There is no single aggregated listing of project status, budget, etc., in the city This makes responding to customer requests and planning difficult. |
| Overall Gap Assessment: | **Severe** |

# 4. RECOMMENDATIONS

## OVERVIEW

This section presents specific recommendations for GIS at the City of Kirkland. During the period June 10th – June 14th, 2005 members of the GIS Steering Team completed a document to prioritize needs and potential recommendations. The results from each document were compiled and weighted according to the formula described in *Appendix C: Project Ranking Process*. Those results are reflected in the recommendations contained in this section.

The recommendations are organized into four categories. Where a recommendation applies to more than one area of the citywide GIS, it is placed in the category that best reflects its primary emphasis:

- **Organizational and Operational** – Suggestions for changes to the way that GIS is organized and administered in the city.
- **Applications** – New software applications that depend on, or are strongly linked to, GIS
- **Technical GIS** – Items where the benefits depend largely on technical GIS issues.
- **Data** – New layers and reorganization of existing data resources.

The recommendations appearing in

Table 8 is linked to both the *Needs Assessment and Gap Analysis* (p.56) and *Implementation Schedule and Budget* (p.82).

Following the table is a complete list of the recommendations made as part of this Strategic Plan. Details for each recommendation can be found in *Appendix A: Detailed Recommendations*. See Table 9 (p.85) for project costs associated with these recommendations.

### Table 8 - Recommendations Summary

| Gap Assessment | Recommendation (starts p.78) | Project Name |
|---|---|---|
| **Organizational/Operational** | | |
| Gap 1 (p.66) | 1. Adjusted Budget Model | (internal policy decision; no project) |
| Gap 2 (p.66) | 2. Centralize GIS Staff | (internal policy decision; no project) |
| Gap 2 (p.66) | 3. Add Public Safety GIS Analyst | Add GIS Analyst (Public Safety) |
| Gap 3 (p.67) | 4. GIS Service Supporting System | GIS Service Supporting System |
| **Application** | | |
| Gap 5 (p.68) | 5. New Intranet GIS Data Viewer | Internal GIS Viewer – Phase I |
| | | Internal GIS Viewer – Phase II |
| Gap 6 (p.68) | 6. Public Access GIS Viewer | Public GIS Viewer Customization |
| Gap 7 (p.69) | 7. Desktop GIS Crime Analysis | Crime Analysis |
| Gap 11 (p.71) | 8. GASB 34 Reporting | GIS-enabled GASB 34 Reporting |
| **Technical GIS** | | |
| Gap 8 (p.69) | 9. Enterprise Geodatabase | Enterprise GIS Geodatabase Migration |
| Gap 9, 12 (p.70) | 10. Data Maintenance and QC | GIS Data Maintenance / QC |
| Gap 8, 13 (p.72) | 11. Geoprocessing Analysis Models | Process Automation (Geoprocessing) |
| Gap 10 (p.70) | 12. Build Capability for 3D GIS | 3D GIS |
| Gap 14 (p.72) | 13. Integrate GIS-Document Management & Other Systems | N/A – Future system project |
| **Data** | | |
| Gap 15 (p.73) | 14. New Core Layers | Environmentally Sensitive Areas |
| | | City-owned Property |
| | | Vertical Survey Control |
| | | Easements |
| Gap 16 (p.73) | 15. City Activity Layers | City Activity Layer |
| Gap 17 (p.74) | 16. Web Interface to Address Database | Master Address Database Services |
| Gap 18 (p.74) | 17. Field Access to GIS | Field Access to GIS – Phase I |
| | | Field Access to GIS – Phase II |
| Gap 2, 19 (p.75) | 18. Support Fire GIS Data and Analysis | Fire District Support |
| Gap 20 (p.76) | 19. Project Control and Tracking (optional) | |

# GIS STRATEGIC PLAN RECOMMENDATIONS

Based on the findings from the investigative portion of this project, subsequent input by city staff, and the Six Year Plan Vision, Woolpert makes the following recommendations (details are provided in *Appendix A: Detailed Recommendations*).

## Organizational and Operational Recommendations

### Recommendation 1 – Adopt an Adjusted Budget Model for Financing City GIS

Adopt a new budget model for GIS to ensure equitable and ongoing funding for the GIS program.

### Recommendation 2 – Centralize GIS Staff within the GIS Division of the Information Technology Department

Centralize all full-time GIS staff for more effective use of limited resources, and a continued high level of service.

### Recommendation 3 – Add a GIS Analyst to the GIS Division Staff with Focus on Public Safety

Create a new GIS analyst position focused on public safety to significantly increase support for Police and Fire, and to relieve the workload of existing analyst positions.

### Recommendation 4 – Implement GIS Service Supporting System

Streamline and enhance the way that City staff gets service from the GIS Division for better resource management in the GIS Division and better service to City staff.

## Application Recommendations

### Recommendation 5 – Create a New Intranet GIS Data Viewer

Create a new GIS Viewer with features that staff has asked for in order to put key business and GIS information into the hands of every employee in the City.

### Recommendation 6 – Create a Public Access GIS Viewer

Provide a public access web page for map layers to improve communications with residents of the City by providing access to information.

### Recommendation 7 – Implement Desktop GIS Crime Analysis Tool

Provide focused Crime Analysis tools to the Police Department to help the Department get a deeper understanding of crime activity in the City.

### Recommendation 8 – Streamline GASB 34 Reporting Process via GIS Interface

Provide simple GIS-enabled GASB 34 reporting tools to enable staff to create accurate reports for compliance and tracking of assets.

## Technical GIS Recommendations

### Recommendation 9 – Fully Implement an Enterprise Geodatabase

Centralize GIS data and analysis tools in one scalable database to support wider access to GIS capabilities and data.

### Recommendation 10 – Streamline Data Maintenance and QC

Create productivity tools for GIS analysts to maintain and QC data with. This will reduce the percentage of time that analysts spend on data maintenance.

### Recommendation 11 – Create Geoprocessing Analysis Models for Reporting and Data Export

Automate commonly requested reports, data exports, and maps to enable GIS users to run complex processes without needing the help of a GIS analyst.

### Recommendation 12 – Build Capability for 3D GIS

Start using 3D visualization at the City to add a new approach to viewing changes caused by projects and decisions.

### Recommendation 13 – Integrate GIS Database with Enterprise Business System including Document Management System (EDMS)

Ensure that GIS tools can be used to retrieve documents from the new EDMS by providing a simple map interface to a wide variety of relevant scanned documents.

## Data Recommendations

### Recommendation 14 – New Core Data Layers

Add key data layers to the enterprise GIS to improve decision making and mapping in the City.

### Recommendation 15 – Create Map Layers Showing City Activity from Existing Business Systems

Create map layers of current city activities to give residents and staff instant map-based views of city activities.

### Recommendation 16 – Centralized Address Database with Web Service Interfaces for Application Integration

Integrate high quality addressing into City business systems to reduce the costs associated with using bad addresses for mailing, mapping, etc.

### Recommendation 17 – Provide Field Access to GIS Data

Enable GIS data viewing and update on mobile computers for City staff to provide access to valuable information in the field as well as in the office.

### Recommendation 18 – Support Fire GIS Data and Analysis Requirements in the GIS Division

Move Fire Department map layer maintenance to the GIS Division to provide complete support for emergency response activities.

### *Optional* Recommendation 19 – Implement Microsoft Enterprise Project Management Suite for Project Control and Tracking

Provide a centralized project management approach for the City to save resources by coordinating intra- and inter-departmental projects.

# 5. Implementation Schedule and Budget

Section 4 presents eighteen specific recommendations. Each of these recommendations is a necessary step towards the city's goal of an integrated enterprise wide GIS. In this section, we consolidate the specific recommendations into individual initiatives.

To create an effective GIS Strategic Plan, the GIS Division will need to group and sequence each initiative of the plan. This will let the city departments anticipate costs, direct the effort required for performing the work, and align the work with other internal initiatives such as the Document Management System, and the potential replacement of Advantage with an alternative permitting system.

## Cost and Effort Estimates

Like any organization, the city is faced with budget and staffing constraints that limit how many of these efforts can be undertaken at one time. Therefore, the initiatives must be distributed over time so that they can be budgeted and staffed properly.

Using the information from the previous section and experience of other organizations, calendar time duration was estimated for each initiative. For each initiative, budgetary numbers were estimated by three categories:

- Vendor costs (hardware and software)
- Consultant labor effort and cost
- City staff labor effort

This detailed information for each project is contained in *Appendix B: Detailed Project Descriptions* (p.103), and was also used to derive the table in the following section.

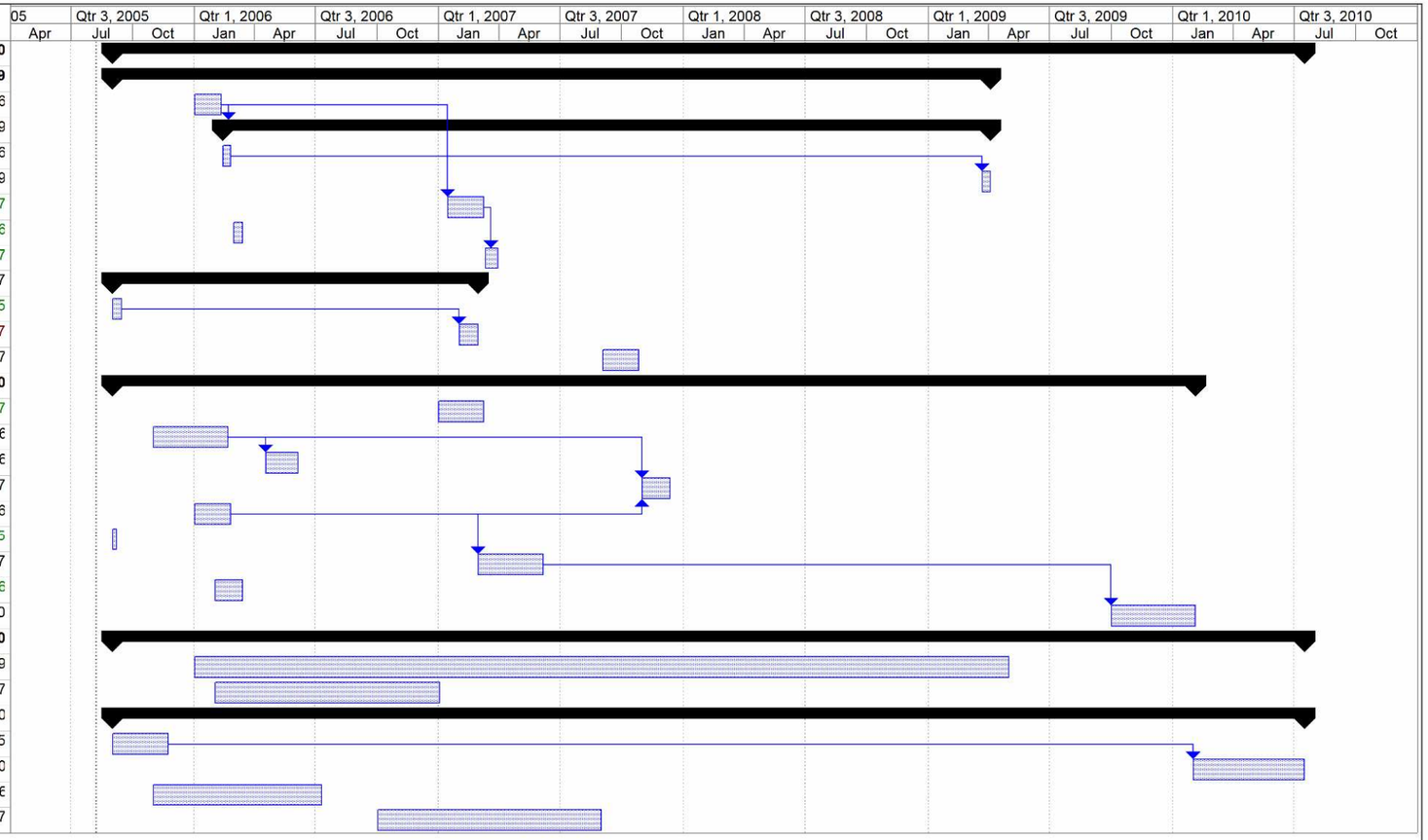
## Proposed Schedule and Budget

### Summarized Schedule Requirements

The proposed schedule is shown below in Figure 11 - Project Schedule. It contains timeframes for each project, and is synchronized with the detailed budget in Table 9 on p.85.

**Figure 11 - Project Schedule**

| ID | Task Name | Start | Finish |
|---|---|---|---|
| 1 | **Kirkland GIS Strategic Plan** | **Thu 9/1/05** | **Fri 7/16/10** |
| 2 | **Operational & Organizational Projects** | **Thu 9/1/05** | **Fri 4/3/09** |
| 3 | Enterprise GIS Migration | Mon 1/2/06 | Fri 2/10/06 |
| 4 | GIS Data Maintenance QC Tools | Mon 2/13/06 | Fri 4/3/09 |
| 5 | Phase I | Mon 2/13/06 | Fri 2/24/06 |
| 6 | Phase II | Mon 3/23/09 | Fri 4/3/09 |
| 7 | Process Automation – Geoprocessing | Mon 1/15/07 | Fri 3/9/07 |
| 8 | Maplex Implementation | Wed 3/1/06 | Tue 3/14/06 |
| 9 | 3D GIS | Mon 3/12/07 | Fri 3/30/07 |
| 10 | Field GIS | Thu 9/1/05 | Wed 2/28/07 |
| 11 | Field GIS Phase I | Thu 9/1/05 | Wed 9/14/05 |
| 12 | Field GIS Phase II | Thu 2/1/07 | Wed 2/28/07 |
| 13 | New GIS Public Safety Analyst | Mon 9/3/07 | Fri 10/26/07 |
| 14 | **Application Projects** | **Thu 9/1/05** | **Wed 2/3/10** |
| 15 | Public GIS Viewer | Mon 1/1/07 | Fri 3/9/07 |
| 16 | Internal GIS Viewer Phase I | Tue 11/1/05 | Mon 2/20/06 |
| 17 | GIS Service Support System | Tue 4/18/06 | Mon 6/5/06 |
| 18 | Crime Mapping Intranet | Thu 11/1/07 | Wed 12/12/07 |
| 19 | Automated City Activity Layer Creation | Mon 1/2/06 | Fri 2/24/06 |
| 20 | Crime Analysis | Thu 9/1/05 | Wed 9/7/05 |
| 21 | Master Address Database Services | Thu 3/1/07 | Wed 6/6/07 |
| 22 | GIS Enable GASB 34 Reporting | Wed 2/1/06 | Tue 3/14/06 |
| 23 | Internal GIS Viewer Phase II | Thu 10/1/09 | Wed 2/3/10 |
| 24 | **Data Projects** | **Thu 9/1/05** | **Fri 7/16/10** |
| 25 | Fire District Data Support | Mon 1/2/06 | Fri 5/1/09 |
| 26 | City Owned Property | Wed 2/1/06 | Tue 1/2/07 |
| 27 | Environmentally Sensitive Areas | Thu 9/1/05 | Fri 7/16/10 |
| 28 | Phase I | Thu 9/1/05 | Wed 11/23/05 |
| 29 | Phase II | Mon 2/1/10 | Fri 7/16/10 |
| 30 | Survey Vertical Control Network | Tue 11/1/05 | Mon 7/10/06 |
| 31 | Easements | Mon 10/2/06 | Fri 8/31/07 |




Project: Project Plan_BudgetAdjusted
Date: Sun 8/7/05

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Page 1

## Budget and Staffing Requirements

Table 9 summarizes the estimated budget and level of effort information contained in the individual project descriptions for each project in the GIS Strategic Plan. All values have been rounded to the nearest $100.

### Notes for Table 9 - Detailed Budget by Project by Year by Fund

The contribution for "Utility Fund" and "General Fund" calculation is loosely based on the 1998 LBIS percentages updated with current adjustments for new projects.

* The hours may vary depending on final project specifications; half of these hours can be absorbed with current staffing level for one-time projects. Some projects may require IT staff and/or department user's time which are not included in the estimate.

** 2005 budget plus partial carry over funding from pervious years

*** The project repeats every two years

**Table 9 - Detailed Budget by Project by Year by Fund**

| Phase II Projects | Kirkland Staff Hours | | '06 | '07 | '08 | '09 | 10 | 11 | Capital Total | Utility fund % | Utility fund $ | General fund % | General fund $ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | One-Time* | Ongoing | | | | | | | | | | | |
| **Organizational** | | | | | | | | | | | | | |
| Centralize GIS | | | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | | $ - |
| Add a New GIS Analyst (Public Safety) ** | | | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - |
| **Operational** | | | | | | | | | | | | | |
| Enterprise GIS Geodatabase Migration | 100 | 104 | $15,000 | $ - | $ - | $ - | $ - | $ - | $15,000 | 60 | $9,000 | 40 | $6,000 |
| Process Automation Using Geoprocessing | 200 | 80 | | $10,000 | $ - | | $ - | $ - | $10,000 | 40 | $4,000 | 60 | $6,000 |
| GIS Data Maintenance / QC Tools | 160 | 80 | $50,000 | $ - | $ - | $52,000 | $ - | $ - | $102,000 | 75 | $76,500 | 25 | $25,500 |
| Maplex Implementation | 80 | 20 | $ - | $ - | $ - | $ - | $ - | $ - | $0 | 50 | $0 | 50 | $0 |
| 3D GIS | 120 | 40 | $ - | $ - | $ - | $ - | $ - | $ - | $0 | 50 | $0 | 50 | $0 |
| Field Access to GIS Phase I (Mobile GIS) | 80 | 40 | $2,500 | $ - | $ - | $ - | $ - | $ - | $2,500 | 50 | $1,250 | 50 | $1,250 |
| Field Access to GIS Phase II | 160 | 40 | $ - | $35,000 | $ - | $ - | $ - | $ - | $35,000 | 50 | $17,500 | 50 | $17,500 |
| System Integration (FireRMS, Hansen, Class, Document Management System) | 120 | 80 | $5,000 | $25,000 | $20,000 | $ - | $ - | $35,000 | $85,000 | 60 | $51,000 | 40 | $34,000 |
| Additional Software License | | | $ - | $ - | $10,000 | $ - | $10,000 | | $20,000 | 30 | $6,000 | 70 | $14,000 |
| Major Software/Application Upgrade | 200 | 80 | $ - | $ - | $20,000 | $ - | $ - | $30,000 | $50,000 | 60 | $30,000 | 40 | $20,000 |
| GIS and Business System Upgrades | 120 | | $ - | $ - | $ - | $30,000 | $ - | $30,000 | $60,000 | 40 | $24,000 | 60 | $36,000 |
| Sub-Total (Capital Organizational & Operational) | 1,340 | 564 | $72,500 | $70,000 | $50,000 | $82,000 | $10,000 | $95,000 | | | | | |
| **Data** | | | | | | | | | | | | | |
| Fire District Support | 400 | 600 | $28,000 | $30,000 | $32,000 | $25,000 | $ - | $ - | $115,000 | - | $0 | 100 | $115,000 |
| Environmentally Sensitive Areas | 100 | 20 | $ - | $ - | $ - | $ - | $47,000 | $ - | $47,000 | 20 | $9,400 | 80 | $ 37,600 |
| City Owned Property | 160 | 40 | $50,000 | $ - | $ - | $ - | $ - | $ - | $50,000 | 53 | $26,500 | 47 | $ 23,500 |
| Survey Vertical Control Network | 40 | | $15,000 | $ - | $ - | $ - | $ - | $ - | $15,000 | 75 | $11,250 | 25 | $ 3,750 |
| Easements | 120 | 40 | $10,000 | $40,000 | $ - | $ - | $ - | $ - | $50,000 | 75 | $37,500 | 25 | $ 12,500 |
| Ortho Updates*** | 200 | | $40,000 | $ - | $85,000 | $ - | $85,000 | $ - | $210,000 | 50 | $105,000 | 50 | $105,000 |
| Data Development Consulting | | | $35,000 | $70,000 | $70,000 | $70,000 | $70,000 | $70,000 | $385,000 | 40 | $154,000 | 60 | $231,000 |
| New Data Development | | | $ - | $ - | $ - | $15,000 | $ - | $ - | $15,000 | 25 | $3,750 | 75 | $ 11,250 |
| Sub-Total (Capital Data) | 1,020 | 700 | $178,000 | $140,000 | $187,000 | $110,000 | $202,000 | $70,000 | | | | | |
| **Applications** | | | | | | | | | | | | | |
| Internal GIS Browser Phase I | 120 | 60 | $79,000 | $ - | $ - | $ - | $ - | $ - | $79,000 | 25 | $19,750 | 75 | $59,250 |
| Master Address Database Services | 160 | 20 | $ - | $59,000 | $ - | $ - | $ - | $ - | $59,000 | 40 | $23,600 | 60 | $35,400 |
| Automated City Activity Layers Creation | 120 | 40 | $29,000 | $ - | $ - | $ - | $ - | $ - | $29,000 | 60 | $17,400 | 40 | $11,600 |
| Crime Mapping Intranet/Crime Analysis | 80 | 20 | $ - | $10,000 | $20,000 | $ - | $ - | $ - | $30,000 | - | $0 | 100 | $30,000 |
| Internal GIS Browser Phase II | 160 | 40 | $ - | $ - | $ - | $20,000 | $30,000 | $ - | $50,000 | 25 | $12,500 | 75 | $37,500 |
| GIS Service Support System | 100 | 20 | $25,000 | $ - | $ - | $ - | $ - | $ - | $25,000 | 25 | $6,250 | 75 | $18,750 |
| Public GIS Browser Customization | 320 | 40 | $ - | $4,000 | $3,000 | $3,000 | $ - | $ - | $10,000 | - | $0 | 100 | $10,000 |
| GIS Enabled GASB 34 Reporting Tools | 80 | 20 | $5,000 | $ - | $ - | $ - | $ - | $ - | $5,000 | 40 | $2,000 | 60 | $3,000 |
| Special Projects | | | $ - | $10,000 | $10,000 | $30,000 | $20,000 | $30,000 | $100,000 | 25 | $25,000 | 75 | $75,000 |
| Sub-Total (Capital Applications) | 1,140 | 260 | $138,000 | $83,000 | $33,000 | $53,000 | $50,000 | $30,000 | | | | | |
| **Capital Replacement** | | | | | | | | | | | | | |
| Server Replacement | | | $60,000 | $70,000 | $ - | $60,000 | $70,000 | $ - | $260,000 | 22 | $57,200 | 78 | $202,800 |
| Plotter/Cutter Replacement | | | $ - | $ - | $ - | $20,000 | $ - | $ - | $20,000 | 22 | $4,400 | 78 | $15,600 |
| Sub-Total (Capital Replacement) | - | - | $60,000 | $70,000 | $0 | $80,000 | $70,000 | $0 | | | | | |
| **Total** | **3,500** | **1,524** | **$448,500** | **$363,000** | **$270,000** | **$325,000** | **$332,000** | **$195,000** | **$1,933,500** | | **$734,750** | | **$1,198,750** |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Uninflated annual contribution: with fire dist cost** | | | | | | | | | | | **$122,458** | | **$199,792** |
| **Uninflated annual contribution: without fire dist cost** | | | | | | | | | | | | | **$180,625** |

# APPENDIX A: DETAILED RECOMMENDATIONS

## Organizational and Operational Recommendations

### Recommendation 1 – Adopt an Adjusted Budget Model for Financing City GIS

*Adopt a new budget model for GIS to ensure equitable and ongoing funding for the GIS program.*

#### *Background*

In the original 1998 Plan, the city adopted a data centric approach to equitably assign the costs of Phase 1 of the GIS program to departments who would benefit the most from the creation of layers. With data this is straightforward: the sewer layer is obviously associated with Public Works so they pay for that, whereas the street centerlines benefit every department so each department pays a piece of that cost. Data layers were listed, ranked, and prioritized by department directors and other stakeholders, and the resulting list had associated budgets associated with it broken down between Utility Fund and General Fund. The subsequent GIS Work Plan budgets have largely been General Fund, with selected new projects utilizing Utility Fund as appropriate.

Beyond these "capital projects" (one time expenditures), a rate model was developed for GIS that closely parallels that of the IT Department. It includes hours worked on projects, GIS license count by department, and infrastructure (GIS servers, databases, etc). This rate model is used to charge back GIS services to each department in a way that fairly represents the use they make of the GIS Division.

#### *Recommendation*

Capital funding should be used to create the building blocks of the GIS architecture. This includes Web-based applications and systems integration. The City of Kirkland will be able to expedite business process streamlining by leveraging the experience of consultants for these areas.

Operation and maintenance costs should be used to support ongoing investment in the GIS. The City of Kirkland will need to play an active role in the development and routine maintenance of the GIS. This includes data, systems, training, and processes associated with the GIS.

The model described in this section was used to determine the budget for Phase 2 of GIS development and uses a similar premise adopted for Phase 1. The model has been adjusted to account for Phase 2 being much

more application development focused rather than data development focused; this fact in borne out by the rankings shown in *Table 12 - Initial Project Rankings* on p.140.

Using these project rankings, the application and data priorities were arrived at and these in turn drive the sequence of the GIS Strategic Plan activities. In keeping with the existing model, a simple approach was used to determine how much each department should contribute:

Take the total cost of a project (whether one-time or ongoing) and split it into equitable percentages based up the perceived benefit realized by each department.

Again, this is very similar to the 1998 Plan approach, and we believe that it is simple, to the point, and it works for the City. For each project in this Strategic Plan a percentage of the total cost has been assigned to departments. It is recommended that the City treat large projects such as initial application development, or data creation, as capital projects with a single one-time startup expenditure, and then migrate to the IT rate model for operations and maintenance.

## Recommendation 2 – Centralize GIS Staff within the GIS Division of the Information Technology Department

*Centralize all full-time GIS staff for more effective use of limited resources, and a continued high level of service.*

Public Works has and will continue to be a major supporter and consumer of City GIS, and it is an open discussion item as to how this department's GIS needs will continue to be met. We recommend that this discussion proceed with the stated goal of achieving, if practical, all city GIS Analyst positions being located in the GIS Division (IT) reporting directly to the GIS Administrator. By locating the Public Works Analyst in the GIS Division, the GIS Administrator can level limited staff resources across many projects for multiple departments without being limited by organizational constraints.

Level of service is an important component of this recommendation. The reason for a dedicated Public Works Analyst is to handle the large volume of data maintenance/QC and projects generated by this department. Rewriting the job description to guarantee a level of service is a prerequisite to migrating the position to the GIS Division: we recommend **no less** than 90% of this position being devoted to Public Works (36 hours in a 40 hour work week). The IT/GIS rate model will apply to this position.

## Recommendation 3 – Add a GIS Analyst to the GIS Division Staff with Focus on Public Safety

*Create a new GIS analyst position focused on public safety to significantly increase support for Police and Fire, and to relieve the workload of existing analyst positions.*

The current GIS program at the City has made great advances with a small staff. Demand for GIS services has increased to the point where the GIS Work Plan of key projects uses all of the GIS Division's resources to their fullest. That leaves little time for new projects recommended in this plan, in particular those related to public safety.

A variety of public safety projects need attention, in particular the Fire and Building Department's emergency response data requirements. A significant amount of GIS analysis and data maintenance is needed to support Fire alone, from helping with potential tools like Deccan, streamlining data flow from Buildings (e.g., floorplans), to the extended data responsibility for Fire District 41. A GIS Public Safety Analyst provides better structural support for Fire; rather than depending on the capabilities of a talented yet "part time GIS" resource, the Fire Chief will have full time support from a dedicated GIS analyst. In addition the standard IT/GIS rate model means easier budgeting and resource management.

In the Police Department the new analyst would have responsibility for helping with crime analysis, gaining intimate knowledge of the GIS requirements of the NewWorld system, and supporting upcoming projects like the in-vehicle mapping system.

Finally this GIS Public Safety Analyst can provide dedicated support to the Emergency Operations Center in times of emergency.

## Recommendation 4 – Implement GIS Service Supporting System

*Streamline and enhance the way that City staff get service from the GIS Division for better resource management in the GIS Division and better service to City staff.*

The GIS Project Request System should be an easy-to-use Web browser based system whereby City staff can submit a request for data, for a map, for analysis, or an update to an address. Each request will include an automatically generated project number, status that can be updated by a GIS Analyst, a description of the project, and Department and e-mail address of the requestor so that project updates can be mailed automatically. The GIS Division staff will also be able to enter the total

time spent on a project; this is just for tracking purposes and *is not* in any way a replacement for the TenRox timekeeping system.

Completed map projects will also be searchable by requestor and date. Each completed map will be uploaded into the project database as a PDF so that City staff can retrieve the original map product without (a) needing to ask GIS or (b) needing to have GIS software on their PC.

This should be written in Visual Basic .NET as an ASP.NET application with a SQL Server back end.

## Application Recommendations

### Recommendation 5 – Create a New Intranet GIS Data Viewer

*Create a new GIS Viewer with features that staff has asked for in order to put key business and GIS information into the hands of every employee in the City.*

The Six Year Plan Vision describes easy access to GIS data for everyone, including both the public and city staff. The central recommendation to meet this goal is to implement a more capable Internal GIS Viewer. As shown in Figure 9 (p.63), complete access to key City databases will be enabled through a **simple yet powerful** online mapping tool. All of the complexity of GIS is centralized in one place and managed by the professionals in the GIS Division, while everyone gains the benefits of GIS through a Web browser. The City realizes two goals through this recommendation: (a) a great **decision support** tool, and (b) **return on investment** for the creation of the GIS base map layers.

Without a doubt, the internal GIS Browser is the most used product that the GIS Division has produced. It should be greatly expanded to support the Six Year Plan Vision goal of enterprise data and tool access. Scalability will be a key factor in the success of this portal. The GIS Viewer will be created over two phases to gradually increase its capabilities such that it becomes the main portal to GIS for every City employee. This is clearly a "quick win" for the City GIS program as it will positively impact a large audience from a wide variety of departments and divisions.

#### *Capabilities*

- **Phase One** – To be done as the highest priority project, this will include all existing capabilities, and add high quality map generation (to scale, with detailed labels and symbology). The application will be designed to be *extensible*. In other words, with initial development done by a consultant to include source code (suggest Visual Basic .NET), the application will be

designed such that the City GIS staff can add their own tools in future without requiring the services of a consultant.

The focus will therefore be on creating a scalable platform for the future while addressing key needs expressed by city staff.

- **Phase Two** – This phase adds layers for Hansen, Advantage, Springbrook, and NewWorld that are refreshed nightly. Many city staff requested two way access to these business systems, but in particular *from GIS to other systems*. Phase Two also includes productivity tools like address list creation, dynamic addressing via Web services, specialized reporting, network tracing and redlining tools.

### *Underlying Technology*

ArcGIS Server is the recommended software platform for the redesigned GIS Viewer. Looking at Figure 12 one sees this as a central piece of ESRI's approach to enterprise GIS and runs in parallel with ArcSDE and ArcIMS. ArcGIS Server is written using software components called ArcObjects; these form the core of almost all of ESRI's ArcGIS product line, with the notable exception of ArcIMS and ArcPad (mobile GIS).

The current GIS Browser is written using the ArcIMS software that the City licensed some two years ago, the City GIS Administrator is a competent HTML/JavaScript developer, and ArcIMS is cheaper than ArcGIS Server. The choice of ArcGIS Server as a platform over ArcIMS requires some explanation.

- **Functionality** – ArcIMS is a high throughput map generation server. It excels at creating maps quickly. However, for more advanced browser-based solutions, developers must get very creative to implement solutions. A good example is high quality cartography. There is a piece of ArcIMS that can generate nice maps (it is called ArcMap Server) but in Woolpert's opinion this is not very customizable, and requires a lot of development effort to create a good end user experience. On the other hand ArcGIS Server is very capable of providing this and many other kind of capability because it uses the *same base objects as the ArcGIS Desktop products*. This is a key distinguisher.
- **Multiple Use** – The Master Address Database project in this plan relies exclusively on advanced functions available only in ArcGIS Server (geocoding in this case). If the City is to invest in one GIS application server for strategic use, choose one that will be leveraged by multiple projects. ArcIMS cannot support the Master Address Database project.
- **Product Direction** – ArcIMS is a strong product with a seven year history. Note also that it is the only server product from ESRI that has not yet been migrated to their ArcObjects platform. Current indications from ESRI are that the future of ArcIMS is closely tied to ArcGIS Server, perhaps as a high performance mapping engine component or complementary product to the ArcGIS Server. Either way, as a product at the beginning of its lifecycle, the future of ArcGIS Server is assured, whereas the long term prospects are not so clear for ArcIMS.

- **Single Platform** – Other application development for the Plan projects will also use ArcObjects because they are for ArcGIS Desktop. The application *development* capabilities of the IT Department are limited, so minimizing the number of tools that must be learned for subsequent application *maintenance* is an important consideration when choosing a platform for key systems like GIS.

The Public GIS Viewer will most likely use the Regional GIS Browser that is under development, which assures that the existing ArcIMS license will not fall into disuse, i.e., the investment is not lost. Should the Regional Browser not fully support the immediate or longer term needs of the City, the work done on the Internal GIS Browser can be leveraged to support public access to GIS data and functions.

## Recommendation 6 – Create a Public Access GIS Viewer

*Provide a public access web page for map layers to improve communications with residents of the City by providing access to information.*

A publicly available GIS Viewer will give residents, business owners, and consultants the capability of viewing City activities, projects, and data in one location. The current plan is for the Regional GIS Browser to fulfill this need. This product is still under development at the time of writing, so its ability to perform the necessary functions (listed below) has yet to be determined:

- Show City of Kirkland core layers, including real property, addresses and streets, aerial photos, crime analysis data, zoning, and environmental sensitive areas and neighborhood information.
- Show the most up-to-date "activity layers" that are created each night by an automated process.
- Include a feedback tool where a person can draw an area on the map and type associated notes. The results are e-mailed to the appropriate City staff.

## Recommendation 7 – Implement Desktop GIS Crime Analysis Tool

*Provide focused Crime Analysis tools to the Police Department to help the Department get a deeper understanding of crime activity in the City.*

Another recommendation (Recommendation 15) will create a constantly updated crime and police activity layer in the enterprise geodatabase. Taken with the Hansen layer created by the same process, the Crime Analyst in the Police Department will have access to a good source of

information for running Hot Spot Analysis and other techniques common to law enforcement GIS.

In order to make crime analysis simpler to run, and more specific to officer needs, it is recommended that the GIS Division assist the Police Department in assessing and choosing a GIS-aware crime analysis toolkit. This may comprise freely available software like the Crime Mapping Research Center tools, commercial tools like CrimeView, or a combination of both. The key is for the City's GIS experts to help the City's crime analysis expert to select a tool that they can support and help with should the need arise.

### Recommendation 8 – Streamline GASB 34 Reporting Process via GIS Interface

*Provide simple GIS-enabled GASB 34 reporting tools to enable staff to create accurate reports for compliance and tracking of assets.*

The City Accountant should work with the GIS Division to assess the GIS-based reporting tools as part of an open procurement process. Any tool selected should work directly against the enterprise geodatabase, and fit with the straight line depreciation approach used by the City for GASB 34 reporting.

The requirements for the GASB 34 tool should include:

- Easy interface to asset information in GIS
- Excel results output
- Flexible query, filter and cross tabulation options.

Although not a complex recommendation, valuation of City assets was cited as primary reason for continued investment in the GIS program, and we believe that this tool provides that capability to the City Finance Department.

## Technical GIS Recommendations

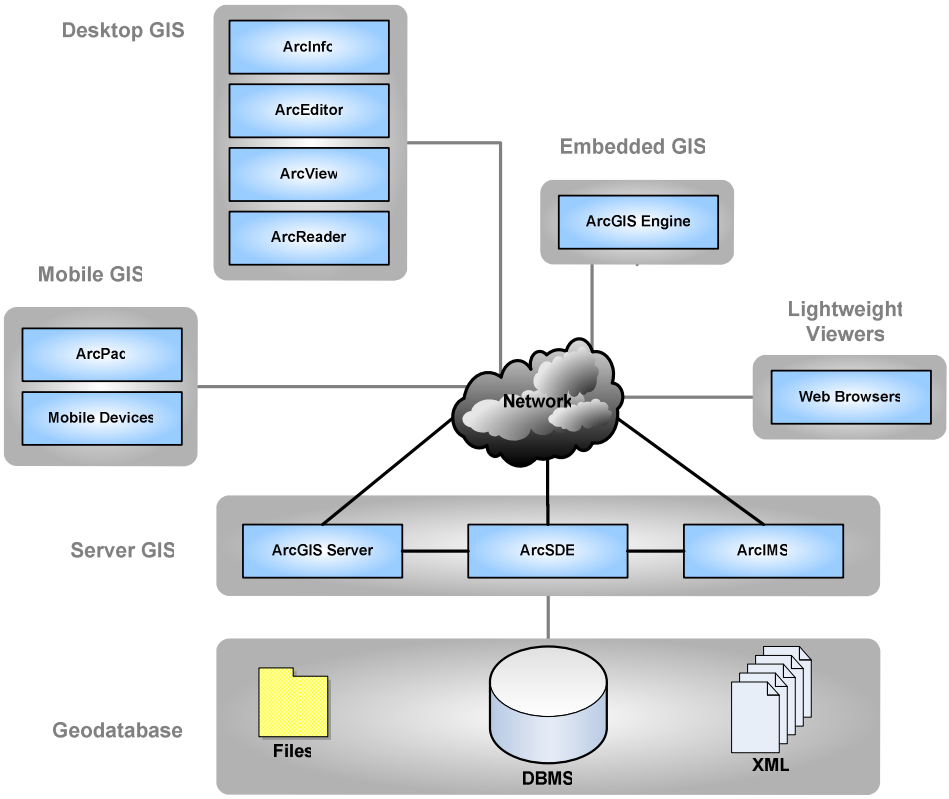
### Recommendation 9 – Fully Implement an Enterprise Geodatabase

*Centralize GIS data and analysis tools in one scalable database to support wider access to GIS capabilities and data.*

This City has chosen ESRI for its GIS software vendor. The Geodatabase is the next logical step for the GIS Division to realize an enterprise class GIS implementation. The Geodatabase simply refers to storing geographic information in a standard relational database like SQL Server

(hence “geo” and “database”). Looking at the GIS Vision in Figure 9 (p.63), the relevance of a strong, well managed GIS database is obvious: every application and maintenance process in the City will depend upon it if the recommendations in this plan are implemented. Furthermore, the geodatabase is the strategic direction for ESRI and as such has a wealth of tools and features that can immediately benefit the GIS Division

**Figure 12 - Enterprise GIS using ESRI**




All of ESRI’s client software connects to server products. The data source for all of the server products is the geodatabase. By completing the ArcSDE implementation, the GIS Division can take advantage of several technical features of the ESRI platform that are specifically designed for centralized GIS data management:

- Versioning – Described more fully in the Data Maintenance Recommendation, versioning is a technique for managing concurrent yet differing versions of the same data.
- Topology – A way of modeling the connectivity and adjacency of GIS data to ensure spatial integrity.
- Geometric networks – For modeling linear networks like water lines, they also are critical in data integrity and network modeling, e.g., isolation traces on pressurized mains.
- Geoprocessing – Special GIS functions can be linked together like a flow chart to build complex processes. These processes are stored within the

geodatabase so that any Desktop GIS user can run them without needing to understand the details of the process, e.g., export specific subset of street lines and attributes for Bellevue Fire Dispatch.

- XML – GIS data can be moved within and between systems much easier using an XML file (structured text with a descriptive schema). Interoperability with non-GIS users, and with outside organizations like eCityGov are made easier.
- Security – Database (SQL authentication) or operating system (Windows authentication) is enforced to tightly control which information any City employee can look at. For example, even though all of the data is stored in a central location, only staff in the "Police" group can read the crime location layer, and only people in the "Editor" group can change information. SDE Views can be used in conjunction with security to share sensitive data.

The City has the base technology in place to accomplish this recommendation. It is a case of revisiting the database design and policies and procedures for maintaining and accessing GIS.

## Recommendation 10 – Streamline Data Maintenance and QC

*Create productivity tools for GIS analysts to maintain and QC data with. This will reduce the percentage of time that analysts spend on data maintenance.*

Data maintenance and quality control (QC) is a major function of the GIS Division. Two areas of improvement will decrease the time spent on these activities without compromising the high quality of GIS data: processes and tools.

### *Processes*

Each core GIS layer has a maintenance and QC plan which incorporates the flow of data and control to keep the core layers up to date. A number of these steps are done because the enterprise geodatabase (ArcSDE) is not used to its full extent. Versioning should be incorporated in every editing process to minimize data transfer and exports/imports, as well as providing a process for accepting or rejecting edits to the layers. Topology should be used where appropriate to ensure spatial integrity of the data.

In some cases, non-GIS Analyst editors may be given permission to edit certain layers. With appropriate permissions, these users can perform updates which are then reviewed (QC'd) by a GIS Analyst before being posted to the production database.

As a lower priority item, the City should consider defining and implementing CAD standards to be used when contractors are submitting digital data. This should be set up as an optional program initially (6 months), and then transitioned to mandatory with a small $25 filing fee

for non-compliant drawings. Standardized files will reduce the time that core layer maintenance will take (real property and utility layers in particular).

*Tools*

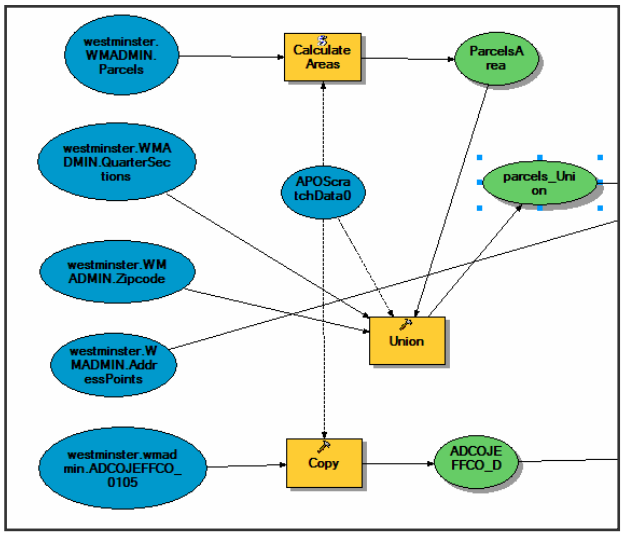
The GIS Analysts have a good handle on the types of new tools and updated tools that they need to be more efficient and accurate with their maintenance activities. These ArcGIS Desktop tools should be developed with significant input from the analysts, and should be written to be configurable wherever possible, e.g., if a layer has a date field that must have the "Created On" date added for a feature, the tool should be configurable to say which field will have the date auto inserted.

The QC part of data upkeep is the most compelling target for automation. The Analysts should have a completely rule-based tool that they can run against entire data layers (or versions). The predetermined rules will be compared against every feature in the layer and a report of rule violations will be created for review. This cycle can be repeated as many times as is necessary with minimal user interaction. Major time savings are anticipated through the use of such tools, e.g., 30 minutes to run a complete QC rather than several hours.

Finally, the ArcGIS Desktop Maplex extension for high quality label/annotation generation should be implemented and configured. Configuration will take some up front work, with large anticipated time savings.

## Recommendation 11 – Create Geoprocessing Analysis Models for Reporting and Data Export

*Automate commonly requested reports, data exports, and maps to enable GIS users to run complex processes without needing the help of a GIS analyst.*




Numerous reports and data products at the City rely on GIS input, output, or processing. The GIS Division is acquiring new skills in creating automated routines in ArcGIS Desktop called "geoprocessing" or GP for short. These GP processes can be simple, e.g., export an enterprise geodatabase layer to an AutoCAD format for a consultant, or complex, e.g., calculate the percentage of land in the City that has land use *x* and capacity *y* that falls within ½ mile of the shoreline. It is recommended that a variety of GP models are created by the GIS Division in consultation with department representatives. While this is an ongoing process, the Strategic Plan

should at a minimum include the following report and process automation:

- Processes to support CIP planning and decision making – requires input from Project Engineers
- Census data summary by non-census area: neighborhood, business district
- Land capacity analysis
- Export subset of layer to shapefile / AutoCAD / personal geodatabase.
- Export street databases specific to NewWorld, Bellevue Dispatch.

These models can be scheduled to run on a regular basis (as Python scripts) or interactively by connecting to the enterprise ArcSDE database from ArcCatalog or ArcMap.

## Recommendation 12 – Build Capability for 3D GIS

*Start using 3D visualization at the City to add a new approach to viewing changes caused by projects and decisions.*

The GIS Division already has a license of the ArcGIS Desktop extensions 3D Analyst and Spatial Analyst. At least one analyst should be trained to use the ArcGlobe and ArcScene applications for 3D visualization. Planning and Police in particular can benefit from this capability for (a) visualizing potential developments and their impact on the City, and (b) planning for homeland security compliance. The City Council will also appreciate the ability to see the impacts of decisions *before* the decisions are made, e.g., how will a major street widening impact a neighborhood.

While the data to support realistic 3D environments for the City is not yet available (e.g., photos of key buildings to use as "skins" for 3D objects), a good degree of progress can be made with existing tools and data.

## Recommendation 13 – Integrate GIS Database with Enterprise Business Systems including Document Management System (EDMS)

*Ensure that GIS tools can be used to retrieve documents from the new EDMS by providing a simple map interface to a wide variety of relevant scanned documents.*

One stated goal of the EDMS project currently underway is to be able to "find relevant documents, maps, meetings, emails, and other references regardless of the data store". For GIS, this is only possible if a well

designed strategy for integration with GIS is formulated. It must include a method for linking documents to GIS features, and GIS features to documents in a many-to-many relationship. This recommendation must necessarily be general in nature because the EDMS has not yet been selected. However, Woolpert can say that either or both of the following are useful requirements in order for integration to be successful: (a) Web service interfaces, and (b) open vendor database access.

Existing efforts integrating the GIS with CMMS, police and fire RMSs, and permitting will also continue to proceed.

## Data Recommendations

### Recommendation 14 – New Core Data Layers

*Add key data layers to the enterprise GIS to improve decision making and mapping in the City.*

Several data layers must either be expanded upon, or created from scratch to support analysis requirements of key groups, or multiple departments. An example use is provided for each:

- City owned property – e.g., finding available properties upon which to place park facilities.
- Environmentally Sensitive Areas – e.g., determine appropriate land use in the long range plan.
- Easements – e.g., identify those areas where new sewer lines can be installed for easy access in the future.
- Vertical control – e.g., improve the accuracy of CAD drawings that are submitted by consultants.

Layer creation should include a geodatabase design, configuration of data maintenance and QC tools, and a maintenance process plan. Initial development should be performed by a consultant while the City GIS Analysts will take on maintenance of those layers. The cost of developing these data layers is in the Implementation Schedule and Budget, and the cost of development and maintenance should be divided between the primary custodian of the layer and other departments that can use the data.

### Recommendation 15 – Create Map Layers Showing City Activity from Existing Business Systems

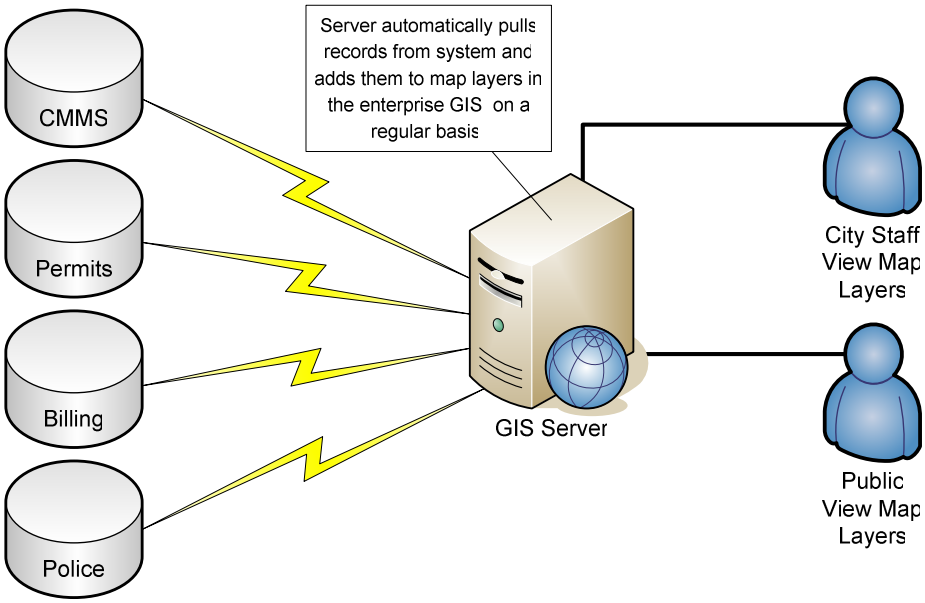
*Create map layers of current city activities to give residents and staff instant map-based views of city activities.*

For each of the major systems (NewWorld, Hansen, Advantage, and Springbrook) an automated process should be written using Windows services, ArcObjects, and .NET. The process will either directly read or import an extract file for the systems. The records will be geocoded if possible, and added to a map layer in the enterprise geodatabase on a nightly basis.

The software should be modular in nature so that other systems can have the same process run against them, i.e., define which fields contain the address, which other fields are in the export, and what the output layer should be called.

Figure 13 shows how this works. A central GIS application automatically retrieves records from a variety of systems. Map layers are created through geocoding, and these layers are then viewable by any City employee through the internal GIS Viewer or via Desktop GIS.

**Figure 13 - City Activity Layers**




These map layers will be used extensively for general analysis, and also for inclusion in the Public and Internal GIS Viewers.

## Recommendation 16 – Centralized Address Database with Web Service Interfaces for Application Integration

*Integrate high quality addressing into city business systems to reduce the costs associated with using bad addresses for mailing, mapping, etc.*

Valid and standardized addresses will be critical to the implementation of any new (or enhancement of any existing) system within the city that

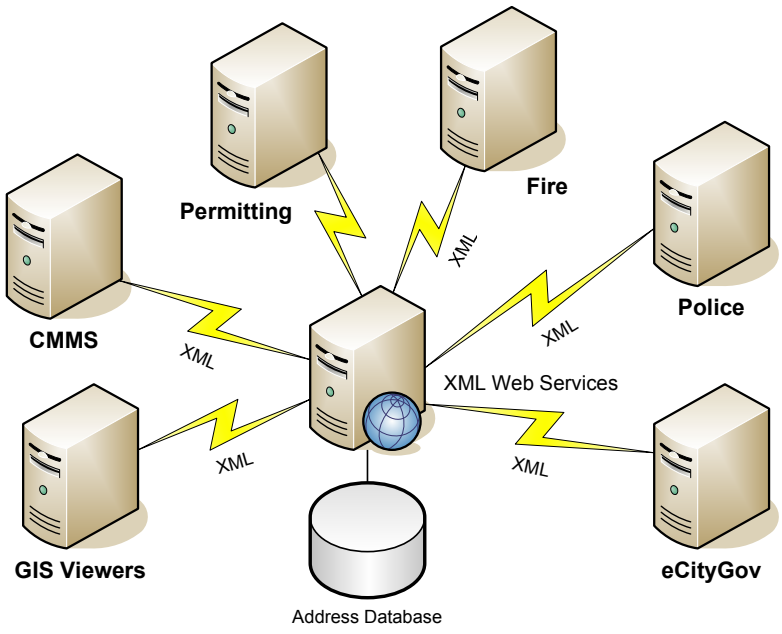
utilizes or creates address information. Currently there are several systems where address information is stored. These include:

- Utility Billing
- GIS
- Maintenance Management
- Permitting
- CLASS
- Regional applications

Instead of each system storing many times conflicting or non-standard addresses, each system should be made to validate its addresses against the master address database, thus leveraging the City's investment in a master addressing system. This will provide a much "cleaner" set of address data within each respective system and allow for greater successes in displaying the location of activities or records within each system on a map.

While this is the ideal situation, there are obvious difficulties in making this happen in anything other than a carefully phased approach. This is a direct function of the wide variety of proprietary business systems in use at the City.

**Figure 14 - Address Web Services**




The existing Address Registry is a big positive step in the right direction. Adding a Web services interface (using ArcGIS Server) to this address system will permit any application to get good addresses in real time. At a minimum the FindAddress, FindIntersection, and FindDistrict

functions should be supported. This is important in particular for online systems like the Regional GIS Browser and Intranet GIS Browser.

Future system purchases at the City should consider the extent to which software can utilize the Address Web Services.

## Recommendation 17 – Provide Field Access to GIS Data

*Enable GIS data viewing and update on mobile computers for City staff to provide access to valuable information in the field as well as in the office.*

GIS data is already used and / or collected in a limited number of cases using ESRI's ArcPad field data collection software. A broader capability of field access to GIS data should be supported via a two phased approach:

- **Phase One Viewing GIS Data** – The goal for Phase I is to enable viewing of data in the field. Use the ArcGIS Publisher extension to create complete packages of maps and data for field staff to use while disconnected from the network. The GIS Division will refresh this export of map data at least once a month and place it on the City Intranet as a download. City staff will be responsible for loading the free ArcReader software on their laptop to view and query these data. For very simple view-only and text search, PDF versions of the various GIS Atlas products will also be available for download from the City Intranet.
- **Phase Two Updating GIS Data** – The goal of Phase II is to expand Phase I with field data maintenance. As part of a coordinated strategy with GIS and Public Works, field editing of utility layers will be supported through the use of ruggedized tablet or laptop PCs that are already in the 2006 budget. For each person needing editing capabilities, an ArcEditor Single Use (SU) license must be purchased and training must be provided by the GIS Division.

## Recommendation 18 – Support Fire GIS Data and Analysis Requirements in the GIS Division

*Move Fire Department map layer maintenance to the GIS Division to provide complete support for emergency response activities.*

A separate recommendation describes the need for, and responsibilities of, a GIS Public Safety Analyst. With the time delay built into the creation of that position, the GIS Division must proactively seek to support the Fire Division with additional data and analysis services. The focus should be on Fire District 41data creation until the GIS Analyst is hired:

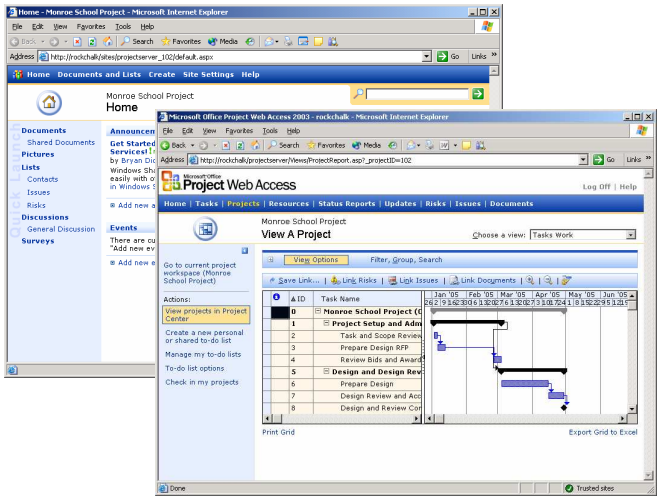
- Streets
- Addresses
- Hydrants
- Edge of pavement

This work should be part of a coordinated strategy with GIS, Fire and Building, and Public Works. The Fire Division should pay 100% of the cost of extending these layers because no other Department has a need for the data in the Fire District 41 service area.

## *Optional* Recommendation 19 – Implement Microsoft Enterprise Project Management Suite for Project Control and Tracking

*Provide a centralized project management approach for the City to save resources by coordinating intra- and inter-departmental projects.*

This is largely unrelated to GIS – hence marked Optional – yet something that we noticed as a gap in the existing flow of information at the City. This is not priced out in the budget, although it is anticipated that this would be a project budgeted and executed by the Information Technology department for citywide use.




We recommend the department implement Microsoft's EPM (Enterprise Project/Portfolio Management) for single point of project management and tracking in Engineering. This is a collection of Microsoft products designed to work together to form a system for enterprise project and portfolio management, resource scheduling and leveling, analysis and reporting. The EPM suite is comprised of the following products:

- **Microsoft Project 2003, Professional Edition** – this is the primary tool for the project manager. Project is still the primary tool for creating project schedules and plans. However, when implemented in an EPM environment, there are additional features and functions available to the project manager for publishing and tracking projects.
- **SQL Server 2000** – all project information is stored and accessed from a SQL Server database.
- **SQL Server Analysis Services** – Analysis Services is used to perform the analysis and reporting on projects and portfolios stored within the EPM suite.

- **Share Point Team Services 2003** – Share Point allows the creation of project websites for each project that is stored in the EPM database. A project may have many associated documents, contacts, task items, etc. associated with the project schedule/plan itself. This is supported through Share Point.
- **Project Web Access 2003** – Project Web Access is the key component to the EPM suite. It is here where projects can be rolled up into portfolios and analyzed and reported on. Resources across the department can be viewed to determine what projects they are assigned to and where there are allocation problems. Web Access is tightly integrated with Share Point Team Services and is fairly transparent to the end user when they are using Share Point vs. Web Access.
- **Outlook Add-In for EPM** – The EPM suite also provides add-intools for Microsoft Outlook. This allows team members and task managers to respond to status updates and progress report requests directly from within Outlook. The EPM database is queried from Outlook and assigned tasks status report requests are added to the user's task list and calendar. When updates are completed, they are immediately sent to the EPM database and the project manager is notified that review is necessary. Once reviewed and accepted, these updates are automatically added to the project schedule/plan and thus overall project.

Following Master Address Database implementation, integration of EPM with GIS (addressing location of projects) is recommended. This will allow more accurate and up to date reports on project status to be generated as well as map locations of projects within the Internal GIS Viewer application.

# APPENDIX B: DETAILED PROJECT DESCRIPTIONS

## INITIAL PROJECT DESCRIPTIONS

Each project has been summarized in a standardized one or two page project description. The format is shown in the first Sample Project, below. Each subsequent page describes a recommended project of this GIS Strategic Plan and includes all of the relevant descriptive, budget, timeframe and resource information for implementation.

# SAMPLE PROJECT NAME

## Description

A general overview statement about the project, including City goals that it meets.

## Benefits

How does this benefit the City:

- Number One
- Number Two
- Last one

## Departments Involved

List the departments involved and affected by the project.

## Implementation Schedule

How long will the project take to complete. Are there other projects that this one depends on?

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | If a consultant is used, the cost goes here. A zero cost indicated a project being done exclusively by the City. |
| Hardware/Software | Initial purchase price |
| City Staff Hours | Staff time for initial project |
| Ongoing Staff Hours | Operations and maintenance hours (annual) |
| Ongoing Cost | Software maintenance fees, hardware upgrades, etc (annual) |

# OPERATIONAL – ENTERPRISE GIS MIGRATION

*The objective of this project is to centralize GIS data and analysis tools in one scalable database. The overall benefit is to support wider access to GIS capabilities and data.*

## Description

The end result of this project will be a fully functional enterprise Geodatabase where best practices are implemented to provide the City with a dependable, easy to use, and flexible central location for data and models. The bulk of this transitional work will be done by the GIS Administrator, with guidance from a consultant with expertise in ArcSDE administration.

It begins with a one day Geodatabase Design Review workshop to understand the current design and anticipated uses of the geodatabase, followed by a brief recommendations report describing how the geodatabase can be adjusted and improved to support multiple uses.

The second component is a short (forty hours) on-call consulting arrangement with a company that has ArcSDE implementation expertise. In our experience dealing with more advanced clients, this is often a more effective approach than a formal implementation strategy. This way, the GIS Administrator can augment her capability in those areas where it is needed, e.g., gaining a fuller understanding of versioning strategies, and database tuning. At a minimum this on-call consulting should result in a document describing the setup, structure, backup and recovery strategy, and other notes pertaining to the City's ArcSDE implementation.

## Benefits

- **Reduce GIS Administrator and Analyst time spent in data transfer and consolidation: 80 hours / year.**
- Streamlined and more secure data access
- Better in-house knowledge of ArcSDE
- Improved data maintenance and QC processes.

## Departments Involved

All City departments impacted.

## Implementation Schedule

If the Geodatabase review, expert assistance and GIS Administrator work is effectively coordinated this project will take 6 weeks.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $15,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 100 |
| Ongoing Staff Hours | 104 |
| Ongoing Cost | $ 0 |

# OPERATIONAL – PROCESS AUTOMATION USING GEOPROCESSING

*The objective of this project is to automate commonly requested reports, data exports, and maps. The overall benefit is to enable GIS users to run complex processes without needing the help of a GIS analyst.*

## Description

The geoprocessing (GP) framework of ArcGIS Desktop enables a GIS Analyst to build a sequential model of a complicated process in a flowchart (using Model Builder) or programmatic way (using Python). The final models and scripts can be housed in the Geodatabase to be run in an *ad hoc* fashion or automatically at a certain time. In this project the GIS Division staff will consult other City staff on key processes that can be automated in this fashion. Two major areas of focus are Data Export and Planning Reports. The GIS Division staff can use skills that they already possess to implement this project, i.e., modeling with Python and Model Builder. **Routine Data Export** will automatically create data products that are routinely asked for by City staff or consultants. This includes various "editions" of the Streets and Addresses layers for Bellevue Dispatch, NewWorld, etc, output from ArcSDE to AutoCAD, and ArcSDE to shapefile. City GIS Division staff will create GP routines to answer very specific questions / reporting scenarios for **Planning Reports** (general "planning", not necessarily just for the Planning Department). It will include land capacity analysis, census reporting by non-census boundaries like neighborhoods, and density of work orders on assets for CIP planning.

## Benefits

- **Reduce time spent by GIS staff responding to recurring analysis requests by 60-80 hours per year.**
- Better flow of information to dependent applications
- GIS users can perform complex operations and reports themselves to reduce load on GIS Analysts

## Departments Involved

All City departments impacted.

## Implementation Schedule

The Data Automation portion is expected to take a total of 3 weeks of time, spread out over a period of 2 months.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 10,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 200 |
| Ongoing Staff Hours | 80 |
| Ongoing Cost | $ 0 |

# OPERATIONAL – UPDATE GIS DATA MAINTENANCE/QC TOOLS AND PROCESSES

*The objective of this project is to create productivity tools for GIS analysts to maintain and QC data. The overall benefit is to reduce the percentage of time that analysts spend on data maintenance.*

## Description

**Processes** – A Process Review Workshop will be held to determine how best to incorporate structural changes in the data maintenance and QC processes. Topics should include disconnected editing, topology, geometric networks, annotation, and geodatabase versioning. A brief report will outline suggested approaches to maintenance and QC that the City GIS Administrator can then incorporate into existing processes.

**Tools** – Probably the area of greatest potential time savings for the GIS is creating tools to streamline the data maintenance and QC procedures. The GIS Analysts have already identified a number of tools and utilities that will benefit them. These include:

- Automated attribute entry for required fields.
- Automated "next ID" function to put unique values in new features.
- Custom snapping routines based on selected feature types.
- Automatically calculate upstream and downstream nodes on a network edge.
- Configurable and automated QC routines.
- Improve operation of Real Property COGO tool.

This project will provide easily configured ArcGIS-based desktop tools to assist the Analysts with day-to-day maintenance.

## Benefits

- Reduce amount of GIS Analyst time spent on data maintenance/QC, freeing them up for more high value work. **For QC in particular this is estimated to be about 120 hours per year.**
- GIS data will be of higher quality and consistency

## Departments Involved

All City departments impacted.

## Implementation Schedule

The Process Review Workshop and associated report will take 1 week. The subsequent maintenance and QC tool development will take approximately 8 - 10 weeks.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 102,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 160 (80 hours on each phase) |
| Ongoing Staff Hours | 80 |
| Ongoing Cost | $ 0 |

# OPERATIONAL – MAPLEX IMPLEMENTATION

*The objective of this project is to reduce the time taken to by GIS analysts to create map labels and annotation. The overall benefit is to reduce the percentage of time that analysts spend on data maintenance and map creation.*

## Description

Maplex is an extension to the ArcGIS Desktop software that the City has already licensed from ESRI as part of ArcGIS 9.x. It is a very powerful rule based labeling engine that automates label and annotation creation, which takes up a large percentage of GIS Analyst maintenance time. Once dynamic labels are created, the Analyst can choose to convert them to persistent map annotations in the enterprise Geodatabase.

## Benefits

- Greatly reduce the need to place map labels by hand. **Estimated 30% time saving on core layer maintenance, or about 200 hours per year.**
- Every GIS user / browser in City has access to very high quality, readable map annotation.
- Faster and cheaper map production.

## Departments Involved

All City departments impacted.

## Implementation Schedule

Based upon experience with the Maplex tool, initial configuration will take GIS Analysts approximately 7 days, with another 2 days spent each year after that.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 0 |
| Hardware/Software | $ 0 |
| City Staff Hours | 80 |
| Ongoing Staff Hours | 20 |
| Ongoing Cost | $ 0 |

# OPERATIONAL – FIELD ACCESS TO GIS PHASE I

*The objective of this project is to get viewable GIS data on mobile computers for City staff. The overall benefit is to provide access to valuable information in the field as well as in the office.*

## Description

The first phase of field access to data is simple yet effective. It uses the ArcGIS Publisher extension to ArcGIS Desktop from ESRI. This extension enables the GIS Analyst to create a map project file that contains all of the map layers, imagery, and labels that are needed by field personnel, and then publish them to a read-only format. The GIS Analysts will need to assess what ArcSDE content to include, then on a monthly basis create a downloadable file for field staff to copy to their laptop / pen computer and open using the free ArcReader software (requires Windows 2000 or Windows XP). This product is simple to use for publishing and reading, and the Analysts will be able to support mobile GIS quite easily in this manner.

A second option for mobile users is simply to download and use the most recent copy of one of the Atlases in Adobe Acrobat (PDF) format that is already available.

## Benefits

- **Reduce lag time in finding out basic information in the field by estimated 2 minutes per map lookup in the field (paper vs electronic)**
- Simple yet effective sharing of entire GIS database
- Reduce paper version of map books
- Supported on any City laptop (Windows XP/2000)
- Free viewing software for unlimited deployment.

## Departments Involved

Public Works, Fire and Building, Police, and Planning

## Implementation Schedule

This simple project should not take City staff more than 5 days to set up.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 0 |
| Hardware/Software | $ 2,500 |
| City Staff Hours | 80 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 500 |

# OPERATIONAL – FIELD ACCESS TO GIS PHASE II

*The objective of this project is to enable GIS data editing on mobile computers for City staff. The overall benefit is to provide access to valuable information in the field as well as in the office.*

## Description

The ArcGIS software system from ESRI has a good field editing strategy that can be adopted by the City once the enterprise geodatabase is in place. For users that are permitted to perform field edits or redlines, they can either make changes directly to map features, or simply use a pen computer to sketch changes that are saved as annotations. The personal geodatabase that they are using is checked out of the main ArcSDE database on a regular basis, and then when the field user is back in the office, the updates are posted back to the central server. From this point the changes (in an ArcSDE version) are subject to the same QC process as every other change to ArcSDE layers.

Each employee performing field edits via a disconnected geodatabase must have an ArcEditor Single Use license installed so that they can run ArcGIS Desktop when a network connection is not available. Phase II recommends starting small, with 2 field editors.

As mentioned, the disconnected editing scenario is well documented by ESRI, and is in use by many of their clients. Consequently the City GIS Division is well equipped to set up and manage this approach to field editing, including the provision of simple ArcEditor training for non-technical staff (estimate 2 days per year for ongoing training).

## Benefits

- **Reduce amount of data *re-entry* that GIS Analysts must perform by 120 hours per year.**
- Full fledged GIS in the field
- Creating data at the source, reviewing and QC in the office.
- Use vendor approved and supported strategy for flow of data.

## Departments Involved

Public Works

## Implementation Schedule

With the assistance of a knowledgeable consultant, this project should take City staff about 4 weeks to set up if completed *after* the Enterprise GIS Migration project, since the GIS Administrator will be trained in disconnected editing and versioning.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 35,000 |
| Hardware/Software | $ 14,200 |
| City Staff Hours | 160 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 3,000 |

# OPERATIONAL – 3D GIS

*The objective of this project is enable city staff to see the GIS data in 3D. The overall benefit is to enhance decision making capabilities by visualizing the built environment before issuing permits and starting development.*

## Description

The City has many of the base layers to start this work, e.g., building outlines, edge of pavement in some areas, shoreline, elevation data. The GIS Analysts will dedicate some time to learning the ArcScene and ArcGlobe tools to create and manipulate 3D views of existing data for planning and development presentations. 3D views will be deployed to non-GIS analysts using the free ArcReader software product.

## Benefits

- Simple yet effective sharing of 3D GIS database
- Supported on any City laptop (Windows XP/2000) that is running ArcReader
- Much better visualization of the impact of decisions *before* the decisions are made.

## Departments Involved

Planning, Public Works, Fire and Building

## Implementation Schedule

This learning will take approximately 2 weeks.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 0 |
| Hardware/Software | $ 0 |
| City Staff Hours | 120 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 0 |

# DATA – FIRE DISTRICT SUPPORT

*The objective of this project is for the GIS Division to maintain the Fire Department map layers. The overall benefit is to provide complete support for emergency response activities.*

## Description

This is a two-part project including data assessment and data conversion.

**Data Assessment** – This is a one-time task to review, analyze, scope, and develop a conversion strategy for all of the existing GIS data that the Fire Department has created. The goal is to migrate appropriate data to the enterprise geodatabase to support Fire Department mapping and analysis. The Fire Department will need to be intimately involved in this project.

**Fire District 41 Base Mapping -** This project includes edge of pavement, building outlines, address points, streets, hydrants, and miscellaneous features. These data layers will reside in the enterprise Geodatabase. A decision will be made on an approach: heads up digitize from orthos, stereophotogrammetry, field mapping, hybrid, or other approach. The cost below does not include the creation and georeferencing of new building floor plans that may be required for pre-fire incident response.

## Benefits

- **Transfer data editing and map production from part time (overtime) staff to permanent GIS Division staff – estimate 160 hours per year.**
- Centralized data support for the entire Fire Department service area
- Higher quality data for emergency response

## Departments Involved

Fire and Building

## Implementation Schedule

The data assessment will take 4 weeks. Based upon the results of this sub-project, the District 41 base mapping will take between 6 and 9 months.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 115,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 400 |
| Ongoing Staff Hours | 600 |
| Ongoing Cost | $ 0 |

# DATA – ENVIRONMENTALLY SENSITIVE AREAS

*The objective of this project is to add the ESA layer to the enterprise GIS. The overall benefit is to improve decision making and mapping in the City.*

## Description

This is primarily wildlife habitat and wetlands mapping. Given the various local, state, and federal regulations on these two categories, it is not recommended that the city cut corners on this project. Particularly with wetlands, this means utilizing subject experts to field-verify features followed closely by reasonably accurate mapping of these. The habitat data acquisition is basically acquiring what the State of Washington maintains and check it against existing base map layers. A second, less desirable alternative for wetlands is to doctor what is currently on the system to reflect other base map layers (pavement, buildings, roads, etc.). This is a nominal improvement but does not necessarily deliver the desired final result: a data layer that is fairly accurate and can be relied on in the permit process.

## Benefits

- **Intangible benefits from cost avoidance through better decision making.**
- Improved decision making for planning and development purposes.
- Regulatory compliance with State of Washington and Federal requirements

## Departments Involved

Fire and Building, Planning, Public Works

## Implementation Schedule

If the preferred (more accurate) approach is adopted, this will require 9 months.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 47,000* |
| Hardware/Software | $ 0 |
| City Staff Hours | 100 |
| Ongoing Staff Hours | 20 |
| Ongoing Cost | $ 0 |

* In addition to current budget amount.

# DATA – CITY OWNED PROPERTY

*The objective of this project is to add the City Owned Property layer to the enterprise GIS. The overall benefit is to improve decision making and mapping in the City.*

## Description

City owned property layer creation includes city source document research and verification, coding of existing features or creation of new ones, and development of a maintenance scheme to keep the data layer current.

## Benefits

- **Intangible benefits from cost avoidance through better decision making.**
- Improved decision making for planning and development purposes.
- Better customer service for construction and land companies.

## Departments Involved

Public Works, Finance, Fire and Building, Planning, Parks, Polices

## Implementation Schedule

This project will take 9 – 12 months.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 50,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 160 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 0 |

# DATA – SURVEY VERTICAL CONTROL NETWORK

*The objective of this project is to improve the vertical control network for the enterprise GIS. The overall benefit is to improve decision making and mapping in the City.*

## Description

City owned property layer creation includes city source document research and verification, coding of existing features or creation of new ones, and development of a maintenance scheme to keep the data layer current. This project has already been budgeted but work has not begun.

## Benefits

- **Intangible benefits from cost avoidance through better decision making.**
- Improved data from contractors and consultants.

## Departments Involved

Public Works

## Implementation Schedule

This project will take 6 – 9 months.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 15,000* |
| Hardware/Software | $ 0 |
| City Staff Hours | 40 |
| Ongoing Staff Hours | 0 |
| Ongoing Cost | $ 0 |

* In addition to current budget amount.

# DATA – EASEMENTS

*The objective of this project is to add the easement layer to the enterprise GIS. The overall benefit is to improve decision making and mapping in the City.*

## Description

This layer will need extensive document research, even though some of this will be caught in the City-owned Property inventory. Essentially, every recorded survey for the city must be reviewed to determine what legal easements exist. These then need to be mapped, a relatively straightforward exercise since most abut or straddle existing property boundaries.

## Benefits

- **Intangible benefits from cost avoidance through better decision making.**
- Sound understanding of City property ownership before projects begin.

## Departments Involved

Public Works, Fire and Building, Planning, Parks

## Implementation Schedule

This project will take 6 – 12 months.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 50,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 120 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 0 |

# APPLICATION – INTERNAL GIS VIEWER PHASE I

*The objective of this project is to create a new GIS Viewer with features that staff have asked for. The overall benefit is to put key business and GIS information into the hands of every employee in the City.*

## Description

The Internal GIS Browser is a Citywide mapping application that runs in a Web browser. Phase I will deliver an ASP.NET application incorporating ArcGIS Server as the mapping engine. It will include the following capabilities:

- Extensible architecture to support future tools and development
- Map navigation (zoom, pan)
- Layer display – turn on and off
- Saved extents (spatial bookmarks)
- Layer query
- Identify
- Map generation – to scale, choice of paper size

The project includes the initial purchase price of the ArcGIS Server software from ESRI (list price $30,000), and $5,000 for a development/staging server.

## Benefits

- **Greatly reduce time spent making "simple maps" by GIS Analysts – estimate minimum 240 hours per year**
- Very simple interface to access complete city GIS data.
- Intuitive, easy map printing significantly reduces load on GIS Analysts for simple map products.
- Centralized application maintenance and hosting.

## Departments Involved

All, with emphasis of layer content being on utilities, i.e., Public Works

## Implementation Schedule

If each task of this project (requirements gathering, design, application development, installation, training) follow on one after another this project will take 14-16 weeks.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 79,000 |
| Hardware/Software | $ 35,000 |
| City Staff Hours | 120 |
| Ongoing Staff Hours | 60 |
| Ongoing Cost | $ 7,500 |

# APPLICATION – MASTER ADDRESS DATABASE SERVICES

*The objective of this project is to integrate high quality addressing into City business systems. The overall benefit is to reduce the costs associated with using bad addresses for mailing, mapping, etc.*

## Description

This application provides a centralized addressing database and methodology across all City applications. **Note: The project does not integrate the centralized addresses into each business system, but does provide a standardized way for current and future systems to access good address information.** In other words, this project results in a way for systems to interface with GIS, but does not create each interface.

To facilitate integration of master addressing with critical systems such as CMMS, permitting, dispatch and project control and tracking, there will be links from the master addressing system that allow each system to query and validate addresses against. Today, SOAP (Simple Object Access Protocol) web services are an emerging standard for integrating applications such as this. This project will create Web services powered by ArcGIS Server geocoding to support master address integration with other systems. The data sources for the services are the address points layer and street centerline layer in ArcSDE. It will include the following capabilities:

- FindAddress() method – Returns either a single match, or a list of matches for further processing by client applications. If a match for a single address point cannot be found, a street centerline geocode will be performed.
- FindIntersection() method – Same as FindAddress, but for street centerlines.
- PointInPolygon () method – This is a general method that accepts a location from a geocode and a polygon layer, and returns which polygon the point is in. Useful for CLASS, neighborhood determination, etc.

This project uses the ArcGIS Server license purchased as part of the Internal GIS Viewer Phase I project.

## Benefits

- **Reduce batch processing time to get accurate locations for City projects (for analysis and map display), largely intangible until implemented but estimate 300 hours per year.**
- Standardized addressing throughout the City means less money spent on cleaning up databases
- Initial development cost is recouped via very simple approach to integrate GIS addresses into other applications
- Excellent support for Internet-based applications in particular

## Departments Involved

All departments.

## Implementation Schedule

This project will take 12-14.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 59,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 160 |
| Ongoing Staff Hours | 20 |
| Ongoing Cost | $ 0 |

# APPLICATION – AUTOMATED CITY ACTIVITY LAYER CREATION

*The objective of this project is to create map layers of current city activities. The overall benefit is to give residents and staff instant map-based views of city activities.*

## Description

This is a precursor to Phase II of the Internal GIS Viewer and other projects since it creates the base layers for "City activity". This simply means automatically pulling records from key business systems, geocoding them, and pushing the results into layers in the enterprise geodatabase.

Where possible, the resulting x,y coordinates of a successful geocode will be pushed back into the host system, e.g., Hansen, so that the same records are never geocoded twice (the assumption being that if a record already has an x,y location, then it has been geocoded before). These processes will run once every 24 hours as a Windows service written using Visual Basic .NET and ArcObjects. The ArcObjects piece will consume an ArcGIS desktop license while running, so overnight execution is recommended.

## Benefits

- **Greatly reduce regular batch processing of addressing from numerous systems. If done on a monthly basis, this would usually take approximately 192 hours per year.**
- Heavily demanded layers will support a wide variety of view and query.
- Increased confidence in GIS data that is never more than 24 hours old.
- Excellent support for Internet-based applications and "what-if" GIS modeling

## Departments Involved

Police, Finance, Public Works, Fire and Building, Planning

## Implementation Schedule

This project will take 6 - 8 weeks if all application development tasks occur one after another.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 29,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 120 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 0 |

# APPLICATION – CRIME MAPPING INTRANET

*The objective of this project is to extend the Phase I GIS Viewer to support simple crime mapping for officers. The overall benefit is to enable officers to view and analyze data quickly in a Web browser without relying on a Crime Analyst or GIS analyst.*

## Description

This project takes NewWorld information that has been automatically mapped using the Automated City Activity project. It combines that with the Internal GIS Browser Phase I, and adds some simple police district mapping summaries, and crime query. It will include:

- Secure Windows logins for Police vs. non-Police users to give access to sensitive information.
- A date range, area based (neighborhood, beat, district) crime mapping wizard.
- Some custom reports that will be defined by the Crime Analyst.

## Benefits

- **Although not done frequently yet (because of technical difficulties solved by this application) this would take about 4 hours for each data refresh rather than being automatically updated every night.**
- Gives officers an easy tool for mapping that is not yet available.
- Provides decision support tools for Detectives to assess crime activity using a Web browser
- Reduces routine mapping workload on Crime Analyst

## Departments Involved

Police Department.

## Implementation Schedule

This project will take 5 - 6 weeks if all application development tasks occur one after another.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $30,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 40 |
| Ongoing Staff Hours | 10 |
| Ongoing Cost | $ 0 |

# APPLICATION – CRIME ANALYSIS

*The objective of this project is to provide focused Crime Analysis tools to the Police Department. The overall benefit is to help the Department get a deeper understanding of crime activity in the City.*

## Description

This project takes NewWorld information that has been automatically mapped using the Automated City Activity project. It combines that with a set of commercially available and/or open source crime analysis tools that plug in to the City standard ArcGIS Desktop software to give the crime analyst effective and easy to use tools for analyzing the NewWorld data. It should include hot spot mapping, thematic mapping, pin mapping, and custom reports that are geared specifically toward officers.

## Benefits

- **Largely intangible benefits of getting critical information in to the hands of police officers.**
- Gives officers an easy tool for mapping that is not yet available.
- Provides decision support tools for Detectives to assess crime activity using a Web browser
- Reduces routine mapping workload on Crime Analyst

## Departments Involved

Police Department.

## Implementation Schedule

This project will take 3-5 weeks.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 0 |
| Hardware/Software | $ 0 |
| City Staff Hours | 40 |
| Ongoing Staff Hours | 10 |
| Ongoing Cost | $ 0 |

# APPLICATION – INTERNAL GIS VIEWER PHASE II

*The objective of this project is to extend the Phase I GIS Viewer with features that staff have asked for. The overall benefit is to put key business and GIS information into the hands of every employee in the City.*

## Description

Building off of the framework created for Phase I of this project, and incorporating the Master Address Database Services, this project will **add significant new capabilities** to the GIS Viewer. At a minimum these should include:

- City "activity" layers, including Hansen, NewWorld, Advantage, Springbrook.
- Address mailing list creation – Graphically select a number of parcels or address points on the map and automatically create an Excel-compatible mailing list.
- Redlining tools – Enabled any City employee to suggest a data change through online sketching and markup tools.
- Addressing – Incorporate Master Address Database Web services for finding addresses.
- Network Tracing – Be able to select customers or utility assets on the map using upstream, downstream, or isolation traces.
- Custom Reports – Incorporate a set of reports that users will define (TDB) in order to quickly service data requests.

There continues to be a focus on providing tools and reports for Public Works.

## Benefits

- **For <u>each</u> City employee and elected official this has the potential to save up to 2 hours per day over manual data lookup and analysis.**
- Pulls together other application projects like master addressing and City activity layers.
- Go-to location for any entry level GIS analysis and query.
- **Advanced** capability on every user's PC via a Web browser.

## Departments Involved

All departments, with focus on Public Works needs.

## Implementation Schedule

This project will take 10 - 13 weeks if all application development tasks occur one after another.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 50,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 160 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 0 |

# APPLICATION – GIS SERVICE SUPPORT SYSTEM

*The objective of this project is to streamline and enhance the way that City staff gets service from the GIS Division. The overall benefit is better resource management in the GIS Division and better service to City staff through an online map library, data updates, and request tracking.*

## Description

An Intranet tool that runs in a browser, this ASP.NET web application supports City staff in making request for maps, address updates, and data products. It tracks who requested a project, their contact information, which department / division they are in, and the time taken to complete the project. Status is tracked via a "% complete" function. Complete map requests cannot be closed until a PDF version of the map product has been uploaded to the Service Support database to ensure that when a requestor lists projects by their name and / or date, they can find their map again.

## Benefits

- **Saves up to 2 hours per request and/or project managed by the system.**
- Better time and resource management for the GIS Division.
- Online summary reports to support IT rate model via project "time taken".
- Self-service map retrieval from the online project archives.

## Departments Involved

All departments

## Implementation Schedule

This project will take 4-7 weeks if all application development tasks occur one after another.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 25,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 100 |
| Ongoing Staff Hours | 20 |
| Ongoing Cost | $ 0 |

# APPLICATION – PUBLIC GIS VIEWER

*The objective of this project is to provide a public access web page for map layers. The overall benefit is improving communications with residents of the City by providing access to information.*

## Description

This is a publicly accessible Web site that enables residents, consultant, business owners, and other interested parties to view activity in the City that is being tracked in GIS.

It is anticipated that the Public GIS Viewer will be based exclusively on the capabilities of the eCityGov Regional GIS Browser that is currently under development. The IT Department already has an arrangement with the GIS Application Development staff at the City of Bellevue with regard to this viewer. Based upon our understanding of this work in progress, and the list of features below, we have made an estimate of resources required to roll the Public GIS Viewer out. Capabilities include:

- City activity map layers (work orders, service requests, crime)
- Project feedback form, including ability to sketch notes on the map for public feedback.
- Neighborhood "hot sheet" activity summary.

## Benefits

- **Largely intangible benefits to the public who can help themselves, and also savings over not having public and consultants visiting public counter for information.**
- Instant access to City project and activity information to anyone who has a Web browser.
- eDemocracy feedback tools.
- Leverages investment in eCityGov initiatives.

## Departments Involved

All departments

## Implementation Schedule

This project will take 8-10 weeks if all application development tasks occur one after another, and assuming that planning City training in Visual Basic .NET takes place (or the City of Belleview GIS Application Developers do the work).

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 10,000* |
| Hardware/Software | $ 0 |
| City Staff Hours | 320 |
| Ongoing Staff Hours | 40 |
| Ongoing Cost | $ 0 |

* In addition to current budget amount.

# APPLICATION – GIS ENABLED GASB 34 REPORTING TOOLS

*The objective of this project is to provide simple GIS-enabled GASB 34 reporting tools. The overall benefit is for the City to create accurate reports for compliance and tracking of assets.*

## Description

The goal of this project is to develop a GIS-based tool for the City Finance Department to use in the GASB 34 reporting process. The hardware / software cost listed reflects only the price of a single license of a typical software product, not implementation services that might be necessary.

The Finance Department must complete a needs assessment, upon which to base a buying decision can be made. Either way, the Accounting Division needs a tool that better connects to live GIS information for reporting.

## Benefits

- **Greatly reduced time to generate reports – estimate 20 hours per report – plus much more accurate assessment of value of City property/assets.**
- More accurate and up to date assessment of City asset inventory and values.
- Meet stated goals of GIS implementation for Public Works (i.e., GASB 34 reporting)
- Less time spent getting data into Excel and more time spent on quantitative analysis of data.

## Departments Involved

Finance, Public Works

## Implementation Schedule

This project will take 4 weeks if all application development tasks occur one after another, and assuming that planning City training in Visual Basic .NET takes place.

## Costs

| Item | Cost / Time |
|---|---|
| Initial Cost | $ 5,000 |
| Hardware/Software | $ 0 |
| City Staff Hours | 80 |
| Ongoing Staff Hours | 20 |
| Ongoing Cost | $ Unknown license renewal fee |

# APPENDIX C: PROJECT RANKING PROCESS

To gauge the impact of, and support for, project recommendations, key stakeholders in the GIS Strategic Plan were asked to complete a survey. The survey listed several parameters that each project could be scored on with guidelines as to how the rankings would apply:

**Table 10 - Project Ranking Criteria**

| | |
|---|---|
| Supports stated goal / mission | 0 = No goal met, 3 = Meets a goal |
| Number of users affected | 0 = No users, 1 = 1 or 2 users, 2 = 2 to 10 users, 3 = More than 10 users |
| Customer service | 0 = No perceived improvement, 1 = Minor improvement, 3 = Significant Improvement |
| Implementation risk | 0 = Significant risk, 1 = Acceptable risk, 2 = Minimal risk, 3 = No risk |
| Capital cost | 0 = More than $100,000, 1 = Between $50-$100,000, 2 = Between $10-$50,000, 3 = Less than $10,000 |
| Maintenance cost (annual) | 0 = More than $20,000, 1 = Between $10-$20,000, 2 = Between $1-$10,000, 3 = Less than $1,000 |
| Implementation time | 0 = More than 18 years, 1 = Between 12 months and 18 years, 2 = 6 months to 12 months, 3 = Less than 6 months. |

A series of weights were applied to give precedence to those criteria that respondents considered important. The weights were used as simple multipliers to each survey. The scores for each respondent were first totaled (i.e., the sum of all of the "customer service" scores was calculated for *each project*), and then the weight was applied.

**Table 11 - Project Weights**

| Supports Stated Budget Goal | Number of Users Affected | Customer Service | Implementation Risk | Capital Cost | Maintenance Cost | Implementation Time |
|---|---|---|---|---|---|---|
| 2 | 4 | 4 | 1 | 2 | 1 | 1 |

For example, if three respondents gave a Customer Service scores of 3, 2, and 2 respectively, then the total "score" for that project is (3+2+2)*4 = 28. The final project rankings are shown below, ordered from highest to lowest.

**Table 12 - Initial Project Rankings**

| Name | Weighted Score |
|---|---|
| Engineering CIP Planning | 225 |
| Public GIS Viewer | 225 |
| GIS Service Supporting System | 221 |
| Internal GIS Viewer Phase II | 211 |
| Mapping Wizard | 206 |
| Addressing Web Services | 203 |
| Internal GIS Viewer Phase I | 201 |
| CAD Standards | 199 |
| Field Mapping Phase 1 - Display | 194 |
| Field Mapping Phase 2 - Edit | 194 |
| GIS Link To New Document Management System | 187 |
| City Owned Property | 187 |
| Easements | 186 |
| GIS Departmental Representative Training | 185 |
| Update GIS Maintenance and QC tools, and Processes | 181 |
| Additional GIS Staff | 179 |
| Fire District Data Address Support | 176 |
| Environmentally Sensitive Areas | 171 |
| Map Book Generator | 164 |
| Citywide Project Management | 158 |
| Automated Advantage Permit Mapping | 155 |
| Fire Data Assessment | 154 |
| Migrate to Enterprise Geodatabase | 143 |
| Consolidate GIS Staff | 142 |
| Vertical Control | 140 |
| GIS Models for Planning Reports | 137 |
| NewWorld Record Mapping | 135 |
| Automated Hansen Workorder Mapping | 134 |
| Police Internal Mapping Website | 134 |
| GASB34 GIS Link | 131 |
| Automate Routine Data Export Processes | 125 |
| Hansen Synchronization | 124 |
| Maplex Configuration and Implementation | 122 |
| Automated Springbrook Account Mapping | 111 |

# APPENDIX D: CITY OF KIRKLAND GIS REPORT CARD

The LBIS Plan was an extremely successful at the City. By organizing projects within the framework of GIS Annual Work Plans, a lot was accomplished in a relatively short time frame. The two tables are color coded and demonstrate this success:

**GREEN** = completed; ***ORANGE** = in progress

**Table 13 - 1998 LBIS Plan Projects**

| PROJECTS | STATUS |
|---|---|
| Hire LBIS Supervisor | GIS Administrator hired in 3rd Quarter 2000 |
| Hire GIS Analyst | Two temporary GIS Analysts hired and converted to FTE |
| Survey Data | Enhanced PLSS network developed as part of 2001-2002 Real Property project |
| Photogrammetric Data | |
| • Vector | Done in 1999; updated in 2002 for expanded project area |
| • Ortho | B/W done in 1999; enhanced resolution, color imagery done in 2002; 2004; ongoing |
| • Slope | Done in 1999; revised in 2002 from improved surface elevation data |
| Real Property Data | |
| • Parcels | Completed in 3rd Quarter 2002 |
| • Easements | " " " |
| • King County Assessments data integration | " " " |
| • Site Address Locations | " " " |
| • QC and maintenance procedures | " " " |
| Political District Data | Completed in 2002 and revised in 2003 |
| Property Owner Notification Application | Completed in 2003 |
| Planning Boundaries Data | Completed in 2003 and Revised in 2004 |
| Zoning Query Application | Built-in functionality of GIS Browser |
| Growth Management Capacity Analysis Application | Completed (on going support) |
| Transportation Network Data | Completed in 2000; revised in 2003 |
| City Atlas Application | Versions for Police, Fire/Building, Planning, and Public Works published in 2002 and 2004 as well as revised each year |
| Spatial Data Warehouse Server | ArcSDE installed and operational in 2002 |
| Map Query/display Application | Built-in functionality of GIS Browser |
| Map Interface to Permit Plan | Included in roll-out of ArcIMS GIS Browser and enhanced in 2004 |
| Ad Hoc Crime Analysis Application | Included in geocoding functionality of ArcGIS and scheduled enhancement in 2005 GIS Work Plan |
| Ad Hoc Fire Incident Reporting Application | Included in functionality of ArcGIS and Crystal Report |
| *Automated Signal Inventory Application | Started in 2004 and scheduled completion in 2005 |
| *Sign Inventory Map Interface | Started in 2004 and scheduled completion in 2005 |
| ArcView Licenses | Deployed during 2000-2003; augmented with expanded ArcGIS capabilities including ArcView extensions |
| Internet Map Server and Software | GIS map server installed and operational in 2002 |
| Geographic Reference Data Server | GIS file server installed and operational in 2001 |
| *Water Utility Data | Scheduled completion in 2005 |
| *Water Utility QC/maintenance Application | Scheduled completion in 2005 |
| Sewer Utility Data | Completed in 2004 |

| | |
|---|---|
| Sewer Utility QC/maintenance Application | Completed in 2004 |
| Storm Utility Data | Completed in 2003 |
| Storm Utility QC/maintenance | Completed in 2004 |
| Street Trees Data | Initial work in 2000; Enhanced Inventory Completed in 2004 |

**Table 14 - Other Major Enterprise Projects Completed or Underway**

| PROJECTS | STATUS |
|---|---|
| Natural Resources Management Project | Completed in 2004 |
| Address Registry Project | Completed in 2003 |
| Support Comprehensive Plan, Neighborhood Land Use Plan, and Surface Water Management Plan Revision | Begun in 2004; on-going |
| Hazard Vulnerability Assessment Revision | Completed in 2004 |
| Digital Map Room | Completed in 2004 |
| GIS-Hansen Integration | Begun in 2002; ongoing |
| GIS-Police Integration (including Medina) | Completed in 2004; ongoing |
| GIS Server Migration ArcGIS Upgrade | Completed in 2004 |
| Regional GIS Browser | Completed in 2004 |
| EOC Mapping | Begun in 2004; ongoing |
| *GIS-Utility Billing Integration | Begun in 2004; ongoing |
| Walkway Inventory | Completed in 2004 |
| *GIS Data Maintenance Process Reengineer | Begun in 2004; ongoing |
| Postcard Mailing | Completed in 2004 |